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Declaration of War

on two axis allies—

WASTE and WEAR!

As we see it, every vital transport vehicle forced out of service by premature, preventable wear, is a loss in America's fight for Victory. Every service part that must be scrapped because of neglect is a gain for our enemies.

In the service field, we must all declare our own war on these two unrelenting enemies—Waste and Wear!

We must pass along what specialized help we have available, to the service men who are going to keep those vehicles running.

In building carburetors, brakes, power braking equipment and other units for the majority of the millions of trucks, tractors, buses and cars now in use, Bendix has necessarily studied field service requirements long and thoroughly. Much of the data resulting from these years of study has been "boiled down" into a simplified "Carburetor Overhaul Procedure Manual" and another Book—"ABC of Vacuum Power Brakes."

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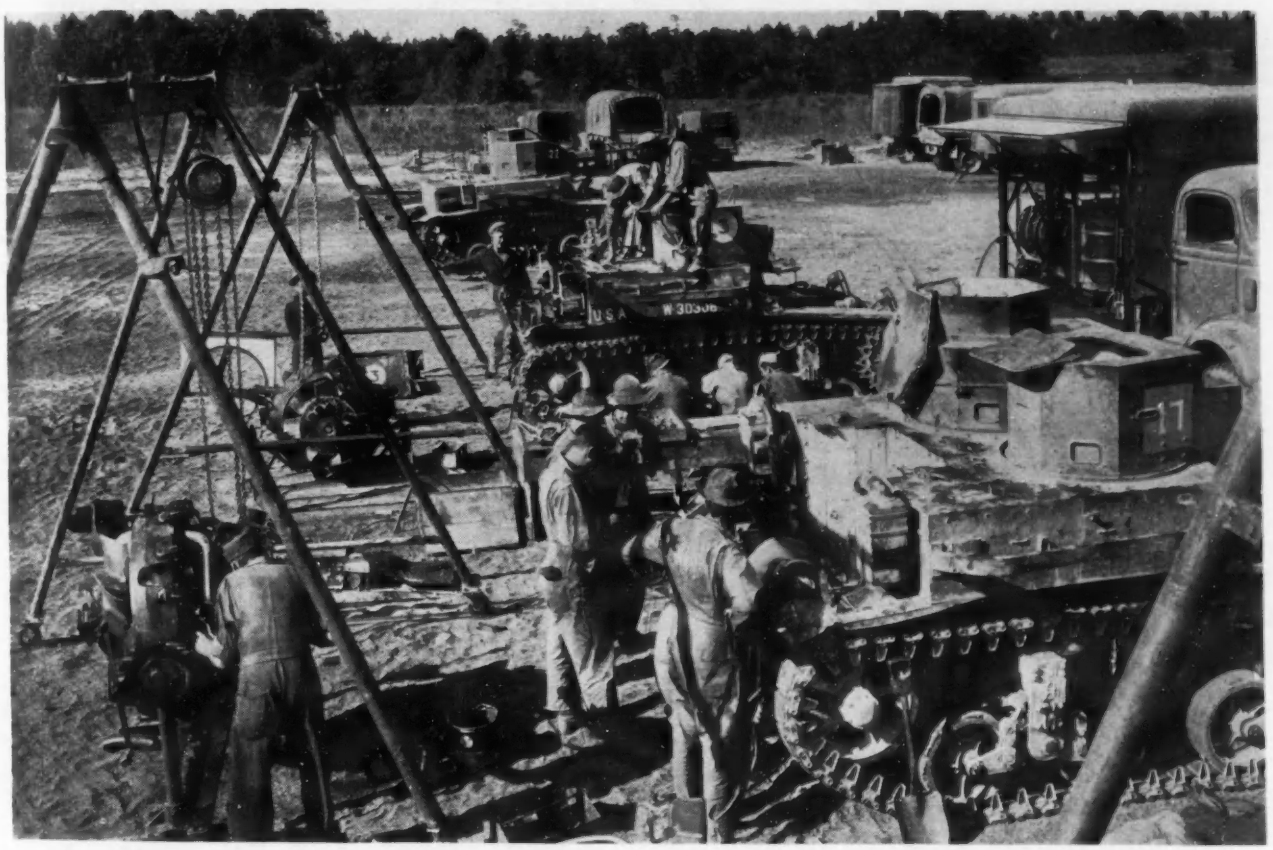
FIELD MAINTENANCE of TANKS

MAJOR-GEN. JACOB L. DEVERS
U. S. Army, Commanding, Armored Force



Photos (pp. 15-19) by U. S. Army Signal Corps

Three light tanks undergoing major repairs at a repair base during recent maneuvers. Tanks are lined up between portable derricks and mobile repair shops

THE servicing of Armored Force vehicles in the field is one of the most interesting subjects and one of the most difficult problems of modern warfare.

The fact is, we have created a monster which, if we can keep it moving, will destroy the most barbaric enemy of all time. The problem is to keep it moving.

The Armored Force is the most complex military organization yet devised by the ingenuity of man. In relation to its man power, it is the most powerful and destructive. Its firepower and speed are the reasons for its existence.

It is composed of eight different arms and services – Infantry, Artillery, Cavalry, Engineers and Ordnance, Signal, Medical and Quartermaster units – all welded into one compact, self-sustaining, armored mass for the purpose of striking the enemy head-on, or else circling him in an enveloping movement and destroying his lines from the rear.

You will note that this objective requires movement, devastating and ruthless power and speed. In a word, an armored force is created for offensive warfare. It does not know the meaning of static or defensive warfare. It is a striking force – the spearhead of modern armies. When, for any cause, it becomes inert before it accomplishes its mission, it is hardly more effective than an arrow which has failed to reach its mark. A tank out of action is less effective than a pillbox, for a pillbox has been strategically placed.

May I repeat with all sincerity, the problem is to "Keep 'Em Rolling." This problem must be solved in the theater of operations, frequently under fire, in and behind the enemy's lines.

Let us see more precisely what this job means.

Our rapidly expanding Armored Force, at the present time, is composed of 8 divisions and 17 separate tank battalions, aside from Armored Force Headquarters and 2 Armored Corps Headquarters, each with a headquarters company. Attached are a number of ordnance companies, tank destroyer battalions, and other units.

[This paper was presented at a meeting of the Detroit Section of the Society, Detroit, Mich., April 20, 1942.]

In each armored division there are several thousand vehicles. Properly spaced for a road march under peace conditions these vehicles occupy well over 50 miles. Between 90,000 and 100,000 gal of fuel are required to move one of these divisions 100 miles. Equally important are oil and grease – 3500 gal of oil – and 275 tons of spare parts.

This gives a suggestion of the problem of supply, without reference to personnel, food, and ammunition; and from all this is deductible the colossal problem of maintenance.

The fighting units of the Armored Force cannot be burdened with enormous supplies and replacement parts. They carry only an amount sufficient to maintain them for a reasonable time, but back of the fighting units are units with a larger stock of supplies. In addition, these organizations are prepared to engage in more difficult repairs. This, of course, is only possible because they are farther to the rear, have better facilities, more time available, and are less interrupted by battlefield conditions. These organizations are known as 4th Echelon, and are supplied by the Ordnance Department and Quartermaster Corps. Also, the Engineer Corps furnishes certain supplies.

From the 4th Echelon establishments, supplies and spare parts flow into the divisions. Vehicle parts and supplies go to the Division Maintenance Battalion. This is the 3rd Echelon of maintenance. From the Division Maintenance Battalion, supplies and parts flow to the different regiments and separate battalions which make up an armored division. In turn, these regiments take care of their respective battalions and companies. These are matters of the 2nd Echelon.

But the most important echelon of all is the 1st Echelon, the individual driver of the vehicle. He is the most important and valuable because here is to be found preventive maintenance. In other words, in this matter of life and death, it is only too true that an ounce of prevention is worth a pound of cure.

In the Armored Force, emphasis is given to the driver's care of his vehicle. His duties are carefully prescribed and a constant check is made to see that he performs these duties correctly and regularly. The driver is charged with servicing, lubricating, tightening, and changing minor parts. In these matters, he has some assistance.

From the driver, let us now go back to the company maintenance section. This is a small crew of men, equipped with a ¼-ton truck, 2 half-tracks, a limited stock of spare parts, and a limited stock of hand tools. This echelon makes a 1000-mile or once-a-month check which, in connection with tanks, is called a 25-hr check. The company, like the driver, makes minor replacements.

Behind the company comes the Regimental Maintenance Company. This echelon is supplied with a larger assortment of parts and equipment. It is here that we find small power tools such as grinders, drills, and presses. We also find battery chargers, electric welding units, and blacksmithing equipment. This advanced 2nd Echelon of maintenance is qualified to replace engines and light tank transmissions. In fact, it is capable of replacing most units and sub-assemblies.

Behind the Regimental Maintenance Company is to be found the backbone of maintenance of an armored division, the Division Maintenance Battalion.

Here you will find a still larger parts supply and larger kits of tools. The maintenance battalion is equipped with larger drills, presses, and grinders. Here, too, are shop tools. The battalion is equipped with special vehicles which

Major-Gen. Jacob L. Devers, Commander of the Armored Forces

permit of continued maintenance during bad weather and during blackouts. This is the 3rd Echelon. Being farther to the rear, it can carry on important and difficult work essential to the fighting men up front. The 3rd Echelon of maintenance is capable of replacing all types of units including medium tank transmissions, which weigh about 8000 lb. It also engages in unit repair, to a limited extent, but does not attempt unit rebuild.

The war on the Libyan and Russian fronts shows battlefield recovery vehicles to be not only important but essential to success. In addition to facilitating maintenance, these vehicles frequently prevent the capture of valuable equipment by the enemy, in the event that reverses are suffered. There is being developed now for American use a trailer tractor-type recovery vehicle capable of transporting the medium tank, which weighs about 30 tons. These recovery vehicles are thoroughly equipped with power wrecking equipment which can winch the disabled vehicles on to a low-slung trailer.

Although battle figures are scarce and undependable, we can get a fair conception of necessary supplies by glancing over accurately kept maneuver records. The 1st Armored Division in Arkansas, Louisiana, and North Carolina, during the maneuvers in the fall of 1941, consumed 1,500,000 gal of 80-octane gasoline; approximately 154,000 gal of 92-octane gasoline; a little less than 100,000 gal of deisel oil; and 35,000 gal of motor oil.

Also, the figures showing the value of parts are interesting. During the same period, approximately $40,000 worth of Quartermaster automotive parts were used and $11,000 worth of motorcycle parts. This consisted of units, sub-

(Upper left) Soldiers working on air-cooled tank engine

(Upper right) Hoisting a 1300 lb aircraft engine out of a tank for tear-down and repair

(Lower left) Refueling a tank from mobile lubrication truck

(Lower right) Mobile repair shops are equipped with drill press, lathe, and small tools

assemblies, spare parts in general, and parts common.

The most frequent failures among armored force vehicles are oil lines on radial engines, diesel engine starters, diesel engine oil pumps, and medium tank carburetor parts. In the case of half-tracks, the rear idlers, front sprocket, and track links, have proved to be the greatest headache.

Possibly, too, it would be interesting to give certain facts regarding the life of our tracks and engines. The life of the track of the light (13-ton) tank is ordinarily about 2500 miles. This includes operation on both sides. The track of the medium (28-30 ton) tank gives approximately 2000 miles. The radial engine in the light tank will give approximately 500 hr of operation. Then it must be given a general overhaul. The medium tank engine has not done quite so well. However, recent modifications and improvements promise considerable relief. In the case of in-line engines, operating as armored force vehicles do in all sorts of weather, off and on hard surfaces, a general overhaul is required somewhere between 9000 and 12000 miles.

From this general outline of various echelons of maintenance, a fair idea may be obtained of how we are trying to solve some of our problems. But from a few typical cases, I believe it will be seen that maintenance procedure in the Army cannot follow a fixed pattern. The work to

Adjusting an engine of an M-3 tank. Safe-like doors protect the engine

be done depends, in general, on five factors: tools, parts, ability, time, and the tactical situation. The repair of a flat tire, for instance, is a simple operation. However, in battle a company maintenance section, although surely qualified to do this, cannot take the time. Similarly, the Regimental Maintenance Company is well qualified to replace a radial tank engine, but under battle conditions this might not be attempted. The job might well be turned over to a unit farther to the rear. In other words, armored force maintenance must be flexible and governed by a spirit of cooperation on the part of echelons. When approaching combat and in actual battle, rear echelons must lend a hand in doing small jobs. After combat, in an area of rehabilitation, every echelon jumps in and does all within the limits of its capability, even though the job is normally assigned to a different unit. I can assure you that the maintenance in the Armored Force has been and will be conducted in just this spirit. There is no place for a soldier who believes otherwise.

Let us look at several typical and, in fact, actual cases of vehicular failures.

Private Roberts, driving down the road during a tactical march, found his light tank transmission getting dangerously hot. In the tank with him was an inexperienced radio operator. In order to get more room, and room is definitely hard to get in a tank, the radio operator carelessly hung his combat jacket on the transmission oil cooler. Driver Roberts soon found that he had a serious condition and, to prevent trouble, pulled off to the side of the road so as to make way for oncoming vehicles. The jacket which had caused the trouble was removed immediately. But the tank must await an opportunity to proceed. To save the company maintenance from stopping to offer assistance, the driver signals them on and joins the tail of the column. In this case, a flimsy garment put a tank out of action.

Another case also illustrates how a small matter can conquer a vehicle. A half-track car suddenly began to sputter and jerk unevenly. Smith, the driver, immediately got off the road so as not to interfere with the column behind. This was according to standing orders. Shortly, the company maintenance arrived, lifted the hood and looked for the trouble. The maintenance sergeant discovered that the sediment bowl had a heavy concentration of water and dirt. A mechanic cleaned this out and started the engine and, at the next break in the column, the half-track and company maintenance proceeded on their way. This was a job which could be done quickly and, therefore, the company did the work. But the company maintenance section would not attempt work requiring a great amount of time.

Private Jones, driving a 2½-ton truck, had trouble somewhat similar to that described in the last case. His truck began to sputter and jerk. He pulled off the road and halted. The company maintenance section stopped and diagnosed the trouble to be a defective fuel pump. The company could not afford to spend time in this repair and, therefore, told the driver to stay with the vehicle and to signal a Regimental Maintenance Crew. Shortly, a trouble shooter from regimental maintenance arrived and stopped to see what was needed. He checked the diagnosis made by the company maintenance and found it correct, then signaled the next regimental crew. The repair was made, and the truck and crew joined the column at the first opportunity.

Another driver of a medium tank on a tactical march noticed that the oil pressure had started to drop alarmingly. Normally, it read 90 psi, but had quickly dropped to around 60. Sensing serious trouble, he pulled to the side of the road and halted. Here the driver found that he had a broken oil line in his engine compartment. The company could not take time for such a job; the regimental crew did not carry an oil line; and, therefore, the repair fell to Regimental Maintenance. The Regimental Master Sergeant reported to the regimental maintenance officer, telling him of the trouble, and then signaled a reserve crew, a parts truck, and a 10-ton wrecker. The oil line was replaced and the detachment moved forward.

Let us assume a case of a light tank developing generator trouble on a march. The march is almost completed with only 2 or 3 miles to the assembly area. The company passes up this job, as does the regimental crew. Realizing that an attack will not be launched for some time, the regimental maintenance officer would attempt to save this vehicle so that it may participate in the fight. But he would not effect repairs on the side of the road, especially with such a short distance to go. He would direct a 10-ton wrecker to hook on to the tank and tow it to the assembly area.

Now comes a medium tank, 30 tons, developing a serious engine condition in the early part of the march. Unless a recovery vehicle is available the Division Maintenance Officer would drop off a crew, a wrecker, and a spare engine to make replacement along the side of the road. This would be done in order to avoid the necessity of towing this heavy vehicle for a long distance.

Maintenance on the battlefield follows somewhat the same pattern. In endeavoring to stay off the sky line, the driver of a light tank drove along the side hill. The track slipped off and became wedged around the drive sprocket. The tank was completely immobile. The company maintenance could not afford the time to do this job and, therefore, dispatched a messenger to the regimental crew which followed the battalion. Being equipped with only a half-track, the regimental crew realized that it could not tow this tank on to the unhooked track. It, therefore, radioed to the Regimental Maintenance Officer, giving the location of the disabled vehicle and a brief outline of what was re-

quired. The Regimental Maintenance Officer, without delay, dispatched a crew and a 10-ton wrecker to the scene. In the meantime, the driver and crew of the light tank, with tools with which they were equipped, disconnected the track in order to facilitate repair. Also, the sergeant in command made plans to destroy his tank in the event of an enemy attack. This he decided to do by breaking a gas line, flooding the vehicle and igniting it. If time permits, an oil line to the engine and transmission can be broken and both run to their destruction.

These cases indicate to what extent we are reliant upon the work of automotive engineers and the quality of material the manufacturers put into our vehicles.

In the Armored Force are all types of vehicles from the 30-ton tank down to the solo motorcycle. In between, are half-tracks, scout cars, 10-ton wreckers, cargo trucks from the 6-ton capacity to the ½-ton capacity, the ¾-ton reconnaissance swamp buggy, and the ¼-ton reconnaissance car.

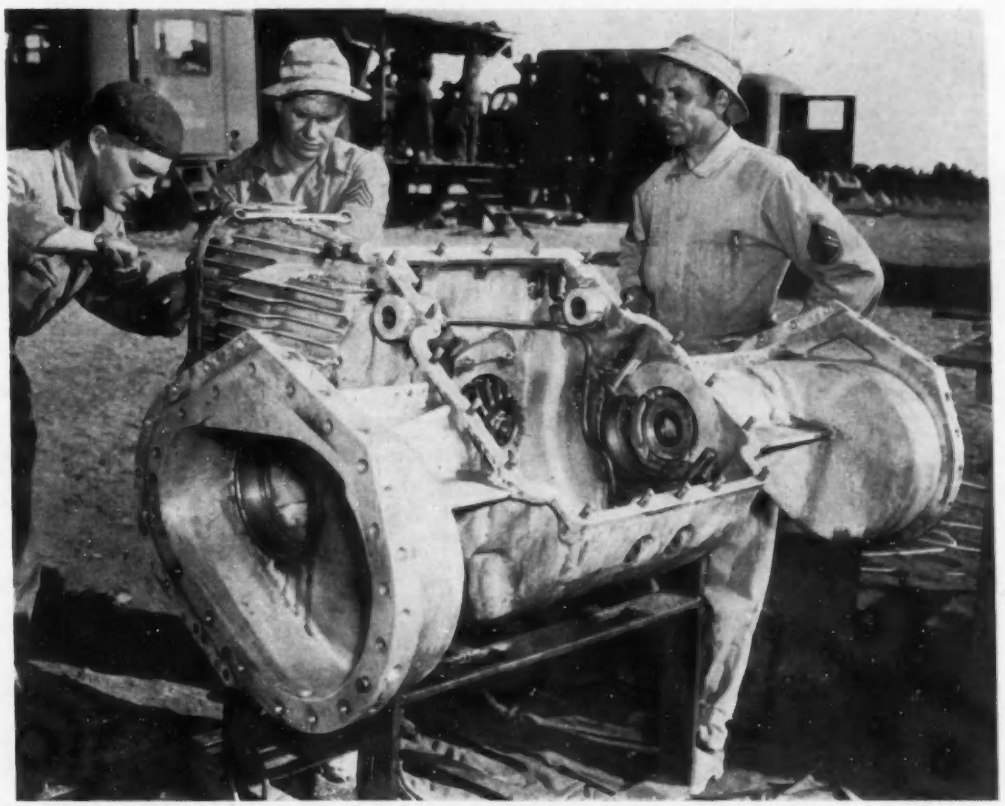
In the Engineer Corps are special vehicles, such as water-purification trucks, air compressor trucks, ponton and bridge trucks. In our maintenance battalion will be found special maintenance vehicles, such as welding trucks, shop trucks, artillery repair trucks, instrument repair trucks. Among combat units are kitchen trucks, fuel and lubricant trucks, and the ration truck. In the medical units are cross-country ambulances, surgical trucks, sterilizing trucks, X-ray trucks, and ward trucks.

For a particularly interesting vehicle, let us consider the light tank, M-3, which has given a good account of itself in Libya. We must have certain characteristics in our fighting vehicles which are not found in the average commercial type. Among other things, we must have space in this tank sufficient for operation of the following: a 37-mm gun, 5 caliber 0.30 machine guns and a "Tommy" gun. Space must be provided for 4 men, 2 canned rations and 1 chocolate ration for each man; also room for the individual equipment of these 4 men such as blankets, gas masks, toilet articles; then we must stow away approximately 9000 rounds of ammunition for the guns, drivers' tools, a small amount of spare parts, 1 gal of water per man per day, first-aid equipment, pioneer tools, such as pick, axe and shovel; a camouflage net, and gasoline for 100 miles of operation (in the case of the light tank this requires the addition of the Jettison or drop-off tank).

As to characteristics and capabilities, this particular vehicle, having fought in battles and having been captured, may be described in detail. It has a gross weight of 14 tons, a maximum allowable speed of 30 mph, ability to span a 7-ft ditch, ability to climb a 30-deg slope, ability to ford through 43 in. of water. The light M-3 tank is 175 in. long, 104 in. high, and 98 in. wide. It must carry 1½ in. of armor plate in front and on the turret and 1 in. armor plate on the sides. The bottom and top armor measures ½ in. It must have a ground clearance of 16½ in., be able to turn on a radius of 20 ft. This vehicle is powered with a Continental radial engine of 7 cyl, 250 hp, at a maximum rpm of 2400. For each type of vehicle, certain characteristics are prescribed, such as I have outlined for the light M-3 tank.

In closing, let us not forget that there is a human side to an armored division. To feed the 700 officers and 14,000 enlisted men requires 44 tons of food each day.

I have tried to show that we have a very large family and a very difficult problem. The assistance of automotive engineers is essential if we are to meet the grave crisis which confronts our country. That we shall meet it, I am confident, and of the outcome, I am certain. It must be and will be complete and unconditional victory.



Repairing an 1100 lb tank transmission during maneuvers last fall in the Carolinas

Standard SAE-ASTM Specifications Recommended for Synthetic Rubbers

RECOMMENDED standard specifications for automotive and aeronautical synthetic rubbers have been completed by Subcommittee V on Synthetic Rubber Specifications of the SAE-ASTM Technical Committee A on Automotive Rubber and are published herewith. They have been approved both by Subcommittee V and Technical Committee A and have been submitted to the SAE for adoption as SAE Standards. Related test methods and requirements, including recommended revisions in present ASTM standards, have been submitted to the ASTM for adoption. J. H. Doering, Ford Motor Co., is chairman of this Subcommittee, and J. V. Hendrick, Chrysler Corp., is secretary.

These specifications mark important progress by the SAE-ASTM Technical Committee A on Automotive Rubber in the intensive work that it has been carrying on in reducing the number of rubber specifications to simplify the compounding problem.

In addition, work on a classification of natural automotive rubbers is nearing completion by Subcommittee IV on Rubber Conservation of which W. J. McCortney and J. C. Dudley, both of Chrysler Corp., are chairman and secretary, respectively.

Classification

FOR the past four months Subcommittee V of the SAE-ASTM Technical Committee A on Automotive Rubber has been working on the standardization of synthetic rubber specifications.

After due consideration, the Subcommittee has concluded that, basically, synthetic rubbers could best be described by grouping them in three classifications. These classifications would depend upon their relative change in volume after immersion in a chosen test fluid. By this scheme current synthetic rubbers will be grouped in the following classifications:

Classification A
Thiokol Type D
Thiokol Type F
Thiokol Type FA

Classification B
Chemigum
Hycar OR
Neoprene Type ILS
Perbunan
Thiokol Type RD

Classification C
Neoprene Type E
Neoprene Type FR
Neoprene Type GN
Neoprene Type M

Every Classification is identified by two letters, followed by three numerals. The first letter is S (standing for "synthetic") followed by A, B, or C depending upon the grouping as just described. Each Classification (A, B, or C) is further subdivided depending upon the ASTM hardness and the original tensile strength. The first numeral refers to the hardness (3 for the 25 to 35 durometer range, 150 ASTM hardness; 4 for the 35 to 45 durometer range, 105 ASTM hardness, and so on); the next two numerals refer to the tensile strength (06 standing for 600 psi, 10 for 1000 psi, and so on). Thus SA-607 represents a synthetic-rubber composition of Classification A having a Shore durometer hardness of 55 to 65 (55 ASTM hardness) and a minimum original tensile strength of 700 psi. In Classifications B and C appear classification numbers ending in 00. These refer to compositions designed for low compression set; the tensile strength and elongation are not specified.

In addition to the original tensile strength and hardness, the tests shown in Tables A, B, and C are necessary to specify correctly common synthetic rubber compositions. These additional tests (described under "Testing Procedure") consist of the measurement of the elongation and the compression set; the change in tensile strength, elongation, and hardness after oven aging; and change in tensile strength, durometer, and volume after oil aging.

These tests are performed in accordance with tentative and standard ASTM methods with exceptions to be described later. The Subcommittee believes that these exceptions are necessary for the testing of synthetic rubber compositions, but not necessary for the testing of natural rubber vulcanizates.

These variations from standard ASTM testing methods were made for the following reasons:

Compression Set (ASTM D-395-40T, Method B)

In the interest of uniformity in testing, a definite deflection has been specified for each hardness range. The ASTM method allows a deflection range for each hardness range.

Oven Aging (ASTM D-573-41)

For Classifications B and C, a temperature of 100 C is preferable to the standard 70 C, because the higher test temperature more closely approximates service temperatures for these classifications.

The ASTM method does not specify a definite time interval.

Table A – SAE-ASTM Synthetic-Rubber Specification Standards

Classification A

(See SAE-ASTM Modified Testing Procedure for Methods of Testing)

Classification Number	ASTM Hardness	Approximate Shore Durometer	Minimum Tensile Strength, psi	Minimum Elongation, %	Maximum Compression Set, %	Oven Aged			Oil Aged		
						Tensile (% Change)	Elongation (% Change)	Durometer (Points Change Limits)	Volume (% Change Limits)	Tensile (% Change)	Durometer (Points Change Limits)
SA – 302	150 ± 20	30	200	500	No test		No test		−15 to 5	−20	−5 to 10
SA – 403	105 ± 15	40	300	500	"		"		− 5 to 3	−20	−5 to 5
SA – 506	75 ± 10	50	600	500	"		"		− 3 to 3	−20	−5
SA – 607	55 ± 8	60	700	400	"		"		− 3 to 3	−20	−5
SA – 706	40 ± 7	70	600	400	"		"		− 3 to 3	−20	−5
SA – 709	40 ± 7	70	900	300	"		"		− 3 to 3	−20	−5
SA – 809	28 ± 7	80	900	200	"		"		− 3 to 3	−20	−5
SA – 910	13 ± 7	90	1000	100	"		"		− 3 to 3	−20	−5

Table B – SAE-ASTM Synthetic – Rubber Specification Standards

Classification B

(See SAE-ASTM Modified Testing Procedure for Methods of Testing)

Classification Number	ASTM Hardness	Approximate Shore Durometer	Minimum Tensile Strength, psi	Minimum Elongation, %	Maximum Compression Set, % Method B	Oven Aged			Oil Aged		
						Tensile (% Change)	Elongation (% Change)	Durometer (Points Change Limits)	Volume (% Change Limits)	Tensile (% Change)	Durometer (Points Change Limits)
SB – 305	150 ± 20	30	500	400	50	−20	−50	0 to 20	−15 to 25	−20	−10 to 20
SB – 309	150 ± 20	30	900	500	50	−20	−50	0 to 20	−15 to 25	−20	−10 to 20
SB – 405	105 ± 15	40	500	400	45	−20	−50	0 to 20	−15 to 25	−20	−10 to 20
SB – 410	105 ± 15	40	1000	500	45	−20	−50	0 to 20	−15 to 25	−20	−10 to 20
SB – 415	105 ± 15	40	1500	500	45	−20	−50	0 to 15	−15 to 25	−20	−10 to 15
SB – 400	105 ± 15	40	....	....	25	....	....	0 to 15	−15 to 25	....	−10 to 15
SB – 508	75 ± 10	50	800	400	40	−20	−50	0 to 15	− 5 to 25	−20	−10 to 15
SB – 515	75 ± 10	50	1500	500	40	−20	−50	0 to 15	− 5 to 25	−20	−10 to 15
SB – 520	75 ± 10	50	2000	500	40	−20	−50	0 to 10	− 5 to 25	−20	−10 to 10
SB – 500	75 ± 10	50	....	....	25	....	....	0 to 10	− 5 to 25	....	−10 to 10
SB – 608	55 ± 8	60	800	300	35	−20	−60	0 to 15	− 5 to 25	−20	−10 to 10
SB – 617	55 ± 8	60	1700	400	35	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 625	55 ± 8	60	2500	500	35	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 600	55 ± 8	60	....	....	25	....	....	0 to 10	− 5 to 25	....	−10 to 10
SB – 710	40 ± 7	70	1000	300	30	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 720	40 ± 7	70	2000	300	30	−60	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 730	40 ± 7	70	3000	400	30	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 700	40 ± 7	70	....	....	25	....	....	0 to 10	− 5 to 25	....	−10 to 10
SB – 804	28 ± 7	80	400	100	30	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 810	28 ± 7	80	1000	150	30	−20	−60	0 to 10	− 5 to 25	−20	−10 to 10
SB – 820	28 ± 7	80	2000	150	30	−20	−60	0 to 10	− 5 to 25	−20	−10 to 5
SB – 902	13 ± 7	90	200	50	40	−20	−60	0 to 5	− 5 to 25	−20	−10 to 5
SB – 910	13 ± 7	90	1000	100	30	−20	−60	0 to 5	− 5 to 25	−20	−10 to 5

Table C – SAE-ASTM Synthetic – Rubber Specification Standards

Classification C

(See SAE-ASTM Modified Testing Procedure for Methods of Testing)

Classification Number	ASTM Hardness	Approximate Shore Durometer	Minimum Tensile Strength, psi	Minimum Elongation, %	Maximum Compression Set, % Method B	Oven Aged			Oil Aged		
						Tensile (% Change)	Elongation (% Change)	Durometer (Points Change Limits)	Volume (% Change Limits)	Tensile (% Change)	Durometer (Points Change Limits)
SC – 305	150 ± 20	30	500	500	70	−15	−40	15	100 to 150	−75	−30 to −10
SC – 310	150 ± 20	30	1000	500	70	−15	−40	15	100 to 150	−75	−30 to −10
SC – 320	150 ± 20	30	2000	500	70	−15	−40	15	100 to 150	−75	−30 to −10
SC – 405	105 ± 15	40	500	500	65	−15	−40	15	90 to 140	−70	−35 to −15
SC – 415	105 ± 15	40	1500	500	65	−15	−40	15	90 to 140	−70	−35 to −15
SC – 425	105 ± 15	40	2500	500	65	−15	−40	15	90 to 140	−70	−35 to −15
SC – 400	105 ± 15	40	....	....	20	....	....	15	90 to 140	....	−35 to −15
SC – 507	75 ± 10	50	700	300	60	−15	−40	15	80 to 130	−60	−40 to −20
SC – 512	75 ± 10	50	1200	300	60	−15	−40	15	80 to 130	−60	−40 to −20
SC – 520	75 ± 10	50	2000	400	60	−15	−40	15	80 to 130	−60	−40 to −20
SC – 530	75 ± 10	50	3000	500	60	−15	−40	15	80 to 130	−60	−40 to −20
SC – 500	75 ± 10	50	....	....	20	....	....	15	80 to 130	....	−40 to −20
SC – 608	55 ± 8	60	800	300	55	−15	−40	15	70 to 120	−50	−50 to −20
SC – 614	55 ± 8	60	1400	300	55	−15	−40	10	70 to 120	−50	−50 to −20
SC – 620	55 ± 8	60	2000	300	55	−15	−40	10	70 to 120	−50	−50 to −20
SC – 630	55 ± 8	60	3000	400	55	−15	−40	10	70 to 120	−50	−50 to −20
SC – 600	55 ± 8	60	....	....	20	....	....	10	70 to 120	....	−50 to −20
SC – 707	40 ± 7	70	700	200	50	−15	−40	10	60 to 110	−50	−50 to −25
SC – 717	40 ± 7	70	1700	280	50	−15	−40	10	60 to 110	−50	−50 to −25
SC – 725	40 ± 7	70	2500	300	50	−15	−40	10	60 to 110	−50	−50 to −25
SC – 700	40 ± 7	70	....	....	20	....	....	10	60 to 110	....	−50 to −25
SC – 804	28 ± 7	80	400	100	50	−15	−40	10	50 to 100	−30	−50 to −30
SC – 808	28 ± 7	80	800	100	50	−15	−40	10	50 to 100	−30	−50 to −30
SC – 815	28 ± 7	80	1500	100	50	−15	−40	10	50 to 100	−30	−50 to −30
SC – 902	13 ± 7	90	200	50	50	−15	−40	5	40 to 90	−30	−50 to −30
SC – 910	13 ± 7	90	1000	100	50	−15	−40	5	40 to 90	−30	−50 to −30

Since an economy of testing time is desirable, the subcommittee suggests a 70-hr period. This amounts to a three-day test, less 2 hr, which allows sufficient time during the working day for inspection of samples after aging.

Oil Aging (ASTM D-471-40T)

The temperatures suggested by the Subcommittee are allowed in the ASTM method. The special aging period was selected for the reasons given in the preceding paragraph.

The immersion medium described by the *aniline point* and *viscosity*, is readily available. Conformity to the aniline-point range is important since this constant predicts the swelling power of the oil. The oil described represents a fluid having the probable maximum swelling power of common commercial petroleum-derived oils.

In the ASTM method the tensile strength after immersion is calculated by means of an ASTM formula which is a combined function of volume change, after immersion, and the aged tensile strength based on the original cross-sectional area of the test specimen. To prevent erroneous conclusions, the Subcommittee feels that this formula should be deleted and the tensile strength after oil aging be calculated on the basis of the original unaged cross-sectional area. This is particularly important in the case of com-

positions which may suffer a decrease in volume as a result of oil immersion.

The proposed tests and limits form primary specifications and are intended merely to describe common synthetic rubber compositions. Undoubtedly, additional requirements will be needed adequately to specify synthetic rubber for special service applications, such as those involving resistance to aromatic fuels, flexing, stiffening at low temperatures, ozone, and so on.

It, therefore, will be the further function of Subcommittee V to investigate and develop suitable test methods for these special requirements. The additional special tests to be considered by the Subcommittee are for:

1. Low temperature to —70 F.
2. High temperature to +350 F.
3. Aromatic fuels.
4. Antifreeze and coolant.
5. Extraction.
6. Ozone.
7. Weather – ultra-violet.
8. Flame.
9. Tear.
10. Abrasion.
11. Flexing.
12. Product application.

The limits or specification of these tests will be determined by each user for specific applications.

To summarize: For example, if a specification for coolant hose having a Neoprene cover and a Hycar tube is requested, it will be written as follows:

a. Cover to be: SC-717.
b. Fabric and number of plies: per user's discretion.
c. Adhesion of plies, and so on: per user's discretion.
d. Tube to be: SB-608 plus No. 4 test and limitations.
e. Burst strength: per user's discretion.

Should a specification for an aircraft diaphragm used in aromatic fuel be required:

a. SB-520.
b. Test 1 and user's limitations.
c. Test 3 and user's limitations.
d. Test 5 and user's limitations.

Testing Procedures

1. *Tensile and Elongation*

ASTM: D-412-41.

2. *Compression Set*

ASTM: D-395-40T: Method B.
Following exceptions:
Deflections of various hardness to be limited as per Table 1:

Table 1

Durometer	Deflection (Per Cent of Original Thickness)
30	40
40	40
50	30
60	30
70	25
80	25
90	25

3. *Oven Aging*

ASTM: D-573-41.
Following exceptions:
Classification A: 70 hr at 70 C.
Classification B and C: 70 hr at 100 C.

4. *Oil Aging*

ASTM: D-471-40T.
Following exceptions:

a. Classification A: 70 hr at 70 C.
Classification B and C: 70 hr at 100 C.

b. Oil to be Rubber Process type:
Aniline Point: 70 C, ±2C(ASTM D-611-41T).
Viscosity: 150 sec, ±10 sec at 100 F(ASTM D-88-38).

c. Tensile: Delete tensile-volume formula under section 10-c and base calculations on original unaged cross-sectional area.

One of SAE's 43 Aero Standards Committees

SAE Standards Committee E-2 on Engine Accessory Drives snapped at its May 14 meeting in New York

(Around the table, beginning at the foreground) W. A. Hurleman, Jacobs Aircraft Engine Co.; J. G. Larger, Wright Aeronautical Corp. (guest); Gustaf Carvelli, Wright Aeronautical Corp.; N. F. Rooke, Pratt & Whitney Aircraft (guest); Chairman G. N. Cole, Pratt & Whitney Aircraft; William Waddell, Lycoming Division, The Aviation Corp.; J. D. Redding, SAE staff representative, Aeronautics Division; E. W. Rentz, SAE staff engineer, Aeronautics Division; and C. J. McDowall, Allison Division, General Motors Corp. Since the start of its emergency program on Feb. 28, 1941, committees of the Aeronautics Division have held over 150 meetings. (For a report of recent progress of the Aeronautics Division, see p. 41, this issue.)

Cooperative Research Council Starts Operation from Radio City Headquarters

A NEW organization, the Cooperative Research Council, sponsored jointly by the SAE and API, has been created *to centralize, correlate, and promote cooperative research activities of the automotive, aeronautic, and petroleum industries.* The Council formally began operation from its new headquarters in Room 1618, 30 Rockefeller Plaza, New York, on May 1. The organization of the Council was approved by the SAE Council on Feb. 14, and by the Executive Committee of the Board of Directors of the API on March 30, after thorough discussion of the many phases of the problem by committees of the two organizations and by conference groups.

SAE and API Equally Represented

The Cooperative Research Council consists of 12 members appointed to serve for one year, 6 representing the SAE and 6 representing the API:

SAE Representatives

B. B. Bachman, Autocar Co.
J. M. Crawford, Chevrolet Division, General Motors Corp.
William Littlewood, American Airlines, Inc.
J. B. Macauley, Jr., Chrysler Corp.
Arthur Nutt, Wright Aeronautical Corp.
C. G. A. Rosen, Caterpillar Tractor Co.

API Representatives

D. P. Barnard, Standard Oil Co. (Ind.)
A. L. Clayden, Sun Oil Co.
T. G. Delbridge, The Atlantic Refining Co.
R. A. Halloran, Standard Oil Co. of California.
K. G. Mackenzie, The Texas Co.
G. G. Oberfell, Phillips Petroleum Co.

At the organization meeting of the council on April 13, B. B. Bachman was elected chairman, and T. G. Delbridge, vice-chairman. C. B. Veal, for 16 years SAE research manager and secretary of the Cooperative Fuel Research Committee, has been appointed secretary of the Council, and R. P. Anderson, secretary, General Committee, Division of Refining of the API, has been named treasurer.

Purpose of Council

The following statement of scope has been approved: "The purpose of the Cooperative Research Council shall be to direct cooperative research in developing the best combinations of fuels, lubricants, and equipment powered by internal-combustion engines."

It has also been agreed that standardization of methods of test, specifications, and classifications shall not be within the province of the Council. It is the intent of the Council that such matters shall be promulgated by appropriate existing agencies.

Committee Organization

The committee organization under the council is at present as follows:

1. The *Cooperative Fuel Research Committee* which has been doing effective work on fuel utilization for the past 21 years.

2. A *Cooperative Lubricants Research Committee*, C. G. A. Rosen, chairman. This committee includes in its work the programs of the following committees:

(a) SAE Aircraft-Engine Lubricants Research Committee.
(b) SAE Crankcase Oil Stability Research Committee.
(c) SAE Engine Wear Research Committee.
(d) SAE Extreme-Pressure Lubricants Research Committee.

3. A *Cooperative Equipment Research Committee*, J. M. Crawford, chairman, to concentrate on mechanical-design considerations involved in the scope of CRC.

4. A *CRC War Advisory Committee* under the chairmanship of J. B. Macauley, Jr., has taken over the important war activities of the former CFR Fuels and SAE Lubricants Advisory Committees in cooperating with government and military agencies requesting advisory service.

Appointed CRC Secretary

C. B. Veal

At his desk in the new headquarters of the Cooperative Research Council, Room 1618, 30 Rockefeller Plaza, New York. For 16 years prior to his appointment as CRC secretary, Mr. Veal was SAE research manager and secretary of the CFR committee

26 T&M Committees to Provide ODT with Technical Information

THE SAE Transportation & Maintenance Activity, working in cooperation with the Office of Defense Transportation, has organized 26 working committees. The work of these committees will be to provide the Office of Defense Transportation with the technical information which will form the basis of the educational function of that agency. The committee reports will be rewritten or abstracted and released by the Office of Defense Transportation to trade magazines, technical publications, newspapers and general magazines as official recommendations and suggestions of the government. The complete reports will be available to all SAE members.

Coordinating Committee Guides Work

The work of these committees is under the guidance of an SAE Coordinating Committee. W. J. Cumming, chief of the Maintenance Section of the Office of Defense Transportation, has been selected as Coordinating Committee Chairman which makes it possible to operate under a chairman who is familiar both with Office of Defense Transportation requirements and SAE procedure. Serving with Mr. Cumming on the Coordinating Committee are six members, each having immediate responsibility for organizing and guiding of a small group of committees: E. P. Gohn, Atlantic Refining Co.; M. E. Nuttila, Cities Service Oil Co.; Warren A. Taussig, Burlington Transportation Co.; E. W. Templin, Los Angeles Dept. of Water and Power; S. B. Shaw, Pacific Gas and Electric Co., and Randolph Whitfield, Georgia Light and Power Co., are the six project chairmen on the Coordinating Committee. SAE T&M Vice President Jean Y. Ray, Virginia Power and Electric Co.; T. L. Preble and Gavin W. Laurie, consultants to the Office of De-

fense Transportation, complete the SAE Coordinating Committee.

Ready to Submit Reports

Some of the committees have been at work for several months and are about ready to submit reports on their respective subjects to the Coordinating Committee. When all of the committees are organized, more than 150 transportation engineers will be actively working for the Office of Defense Transportation, and the advice and experience of many more will be sought. The various subjects which are being studied by committees are listed below:

Subjects for Committee Study

1. Engine temperature control.
2. Reconditioning cylinder blocks – fitting sleeves
3. Pistons ot fit reconditioned cylinders
4. Technique in fitting undersize bearings
5. Use of expander-type piston rings to prevent excessive cylinder reconditioning
6. Enhancing the intensity of vehicle usage
7. Driver training
8. Training of mechanics
9. Preventive maintenance – inspection and procedure
10. Conservation through safety
11. Engine deposits, prevention, and removal
12. Standard practice instructions
13. Tire maintenance
14. Reground pins, bolts, and so on, to fit "off-the-shelf" bushings
15. Frequency of failures
16. Reconditioning brake drums – limits and tolerances
17. Plain bushings to replace ball and roller bearings
18. Reboring and fitting for oversize ball bearings
19. Chromium plating
20. Metal spraying
21. Welding
22. Hard surfacing
23. Load distribution factors
24. Minimum cab dimensions
25. Static charges and remedies
26. Rebuilding batteries

A New World Through Aviation Envisioned by William Stout

▪ *Metropolitan*

AVIATION is reshaping the world not only as an instrument of war but as a basic economic factor of peace, according to William B. Stout, president, Stout Engineering Laboratories, Inc., in a talk before the Metropolitan Section, April 16.

With wit, and trenchant observation, he forecast for the future:

Multitudes of unbelievably safe private planes

Huge freight transport planes

Increased use of helicopter and autogiro types

A light plane engine of 100 hp, weighing 100 lb, and costing $100.

War Dependent on Transportation

Concerning the successful prosecution of the war today, Mr. Stout said: "Transportation is vital, and air transport must become preeminent. It is the form of transportation which is the fastest, and it is unlimited by direction – airplanes can go

SAE-ESD WAR PRODUCTION

THIS meeting is sponsored jointly by the SAE Detroit Section and by the Engineering Society of Detroit, with the cooperation of the SAE Aircraft and Aircraft-Engine Activities under the direction of SAE Vice Presidents Peter Altman and Carl F. Bachle, respectively. It is the first of a series of meetings planned to "bring the 1942 Summer Meeting to the members"; the three-session technical program lists two outstanding aeronautical papers selected from those scheduled originally for presentation at the Summer Meeting.

A salient feature of the program planned by a joint SAE-ESD Committee appointed to conduct the meeting, is the aircraft, engine, and parts exhibit being prepared by the Ford Motor Co., under the direction of Messrs. Henry Ford, Edsel Ford, C. E. Sorensen, and the Ford engineering and production staff. The exhibit will display a number of United Nations and Axis aircraft engines, including a Jap engine taken from a raiding plane shot down over Pearl Harbor, historic aircraft engines, and centrifugal castings.

To illustrate the extent to which the standardization work of the SAE Aeronautics Division has been carried, the SAE will display a special exhibit of Aeronautical Standards publications.

To facilitate free and unhampered discussion, each individual attending the meeting must be prepared to present satisfactory evidence of citizenship, or special clearance for foreign nationals. Special arrangements have been made with the local representative of the U. S. Army Air Forces for the identification and clearance of members and guests.

• PROGRAM •

Technical Sessions – Main Auditorium

11:00 A.M. Meeting – SAE

S. K. Hoffman, Chairman
The Aviation Corp., Lycoming Division

Correlation of Ground and Altitude Performance of Oil Systems

– H. C. Karcher and J. Dulza, Allison Division, General Motors Corp.

●

Exhibit of Aircraft Parts

Banquet Hall

Open 10:00 A.M. to 11 P.M., June 8

This exhibit of aircraft production parts has been specially prepared by the Ford Motor Co. to show how the automotive production capacity of the nation can be converted in an emergency to produce military aircraft.

●

3:00 P.M. Meeting – SAE

R. N. DuBois, Chairman
Aircraft Division, Packard Motor Car Co.

Design Features of the Mitsubishi Ginsel Engine

– W. G. Ovens, Wright Aeronautical Corp.

8:00 P.M. Meeting – SAE-ESD

Arthur Nutt, Chairman
Wright Aeronautical Corp., and SAE Past President

Our War Production Effort in Aircraft

– T. P. Wright, assistant chief, Aircraft Branch, War Production Board.

Meeting on of AIRCRAFT

Horace H. Rackham Educational Memorial Building

DETROIT-JUNE 8

Description of Exhibits

Exhibition open 10:00 A.M.-11:00 P.M.

***AIRCRAFT ENGINES**

This exhibit will include U. S. engines, Axis engines, and parts. On exhibit will be the No. 3 Wright engine, the Liberty engine made by the Ford Motor Co., and used in World War I, a model of the Ford experimental-design liquid-cooled aircraft engine, an 8-cyl adaptation of this liquid-cooled engine now in production, a French Gnome rotary engine used in World War I, a Pratt & Whitney R-2800 engine, a German Daimler-Benz engine, and a Japanese engine from Pearl Harbor. The historic engines – the No. 3 Wright, the Liberty, and the Gnome engines – are from the Edison Institute Museum, Greenfield Village, Dearborn, Mich.

***PARTS DISPLAY**

This exhibit will show changes made in designs and methods, and the application of automotive manufacturing methods to attain quality production and mass output. Parts on exhibit will include centrifugal castings which may replace aluminum forgings and castings. Other parts will be plastics – suggesting some uses of these materials to replace both aluminum and steel. Airframe parts, and a breakdown to show how transportation and reassembly of airframe parts have been simplified by re-grouping subassemblies into partial assemblies, will be incorporated in the exhibit.

***SPECIAL TRAILER EQUIPMENT**

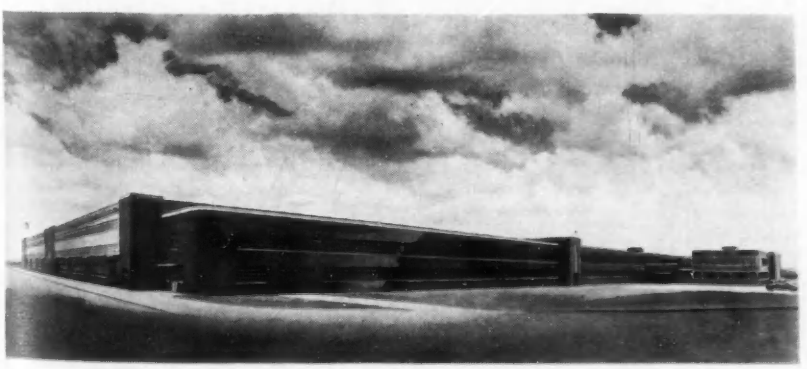
In conjunction with the exhibit in the auditorium, Ford Motor Co. will exhibit special trailer equipment being used to transport large subassemblies of aircraft to plants in distant parts of the country for assembly. This trailer equipment will be on exhibit in front of the Horace H. Rackham Educational Memorial Building.

***VILLAGE INDUSTRIES EXHIBIT**

A series of displays of parts and photographs will show how plants in the Ford village industries have been changed from automotive work to full participation in the war effort. This part of the exhibit will illustrate possibilities and advantages of decentralization of war industry; it also will show the extent of the potential war contributions of small plants and rural factories elsewhere.

***PHOTOGRAPHIC EXHIBIT**

Decorative murals and interesting, informative photographs in the exhibit will show interior and exterior views as well as actual production scenes of the Ford Airplane Engine Plant and Bomber Plant.



New Ford Bomber Plant at Willow Run

anywhere; ships, locomotives, and similar vehicles follow fairly well defined paths, both horizontally and vertically. The fighting fronts now shaping up can be serviced adequately only by air; speed is vital."

At another point in his speech, Mr. Stout emphasized that "an engineer's job is to know facts. To solve a problem, you must first know what the problem is. An accurate analysis of a problem may be more involved and difficult than the solution based on the true facts disclosed by that analysis."

Secrecy Recommended

The speaker impressed upon his audience the need for secrecy regarding many of the amazing and strategic developments now under way, although he did promise that such advances, when finally brought to light, will prove again the resourcefulness and abilities of the engineers of this country. The airplane is remaking the world, he said; technological progress is so rapid as to encompass in a year or two what decades of normal peacetime activity could achieve.

In closing, he paid tribute to the American workman who is doing a marvelous job of winning the war on the production line; and to the many members of the Society who are serving the country actively today as members of the armed forces, and as consultants and specialists for numerous government agencies.

A brief appeal for scrap conversion and collection, and cooperation with local conservation authorities by all engaged in transportation work, was voiced by Chairman Clayton Farris during the meeting.

Volume Production of Manifolds Attained by "Flow" Method

▪ Southern California

STEPPING-UP the fabrication of aircraft exhaust manifolds from a hand operation to a volume production job by the "production flow" method, was discussed by Ernest A. Moore, factory superintendent, Ryan Aeronautical Co., at the two-panel May 8 Southern California Section meeting. "Design Aspects of Aircraft Exhaust Systems" was the title of the second paper, delivered by Ralph L. Haver, Ryan design engineer.

To determine the most productive shop arrangement for making aircraft manifolds, an analysis of the existing system was made at Ryan by means of a "Flow Process" chart, Mr. Moore said. The chart keeps a complete record of the part from its inception as a drawing to its completion as a finished product. All operations to which the part is subjected are divided up on the chart into the classifications of operations: transportation, storages, and inspections, Mr. Moore said.

A revealing story of lost time, lost parts, wasted energy, and loss of production was brought to light through this analysis, he declared, adding that, in addition, errors of a grave nature in so far as production was concerned, were uncovered even though they had existed for long periods of time literally under the noses of the men in charge.

After the "Flow Process" chart had been carefully analyzed it became a useful tool to develop conventional template layouts of manufacturing space available, Mr. Moore said. Then followed a relocation of weld-

ing equipment, machine equipment, and assembly fixtures, to intercept the "Flow" as indicated on the chart.

With the production system set up, production control was then tackled, the engineers were told. It was found that a modified "block system," used with such success in the garment industry, was the most satisfactory method of controlling the flow of parts. The "Production Flow" is controlled through Control Points established along the lines of production, Mr. Moore said.

Card System Successful

Parts are stamped in large quantities, pickled, and sent to permanent storage, Mr. Moore continued. From here on all work is controlled by "work progress cards." These cards allow the work to progress through the system in predetermined lots. When the card is filled, it is signed off by the leadman of the group, who receives another card from the dispatch station together with any additional parts required. As each control point receives a work progress card, together with a block, or lot, or parts, it is entered on a graph in the dispatch station. Only one card is issued ahead of the schedule which prevents any operation from getting too far ahead and permits a much better distribution of manpower.

"A flow production system, unlike the conveyor belt or continuous assembly method, is extremely flexible and can be added to, cut down, or modified in any manner to meet special requirements," Mr. Moore concluded.

Design of aircraft exhaust systems must be considered in connection with the design and installation of the other parts of the powerplant at the period when initial layouts and considerations are made, Ralph Haver said in delivering the second paper of the meeting. Unfortunately, until recent months exhaust systems were the last item for consideration in the powerplant installation, he said, with the result that the system had to be designed to fit in the remaining available space.

The first decision to make in exhaust system layout, Mr. Haver said, is what type of system of three possible styles to use: the conventional slip joint manifold; the Universal Joint manifold; or the short stack, or ejector stack type. Next to determine are the basic locating dimensions. From these data a fairly accurate mock-up can be made to prove out all the basic layouts made for the complete powerplant installation, he concluded.

Tells How Ground Checking Cuts Down Flight Testing Time

▪ *Chicago*

CHICAGO Section's aviation meeting in May, featuring a flight test engineer's first hand report of air line flight testing, together with an interesting tour of the air via a remarkable series of Kodachrome pictures, brought some 300 members and guests to the dinner meeting held in the main ballroom of the Knickerbocker Hotel.

Ralph S. Johnson, tester of 2000 or more airplanes, and project engineer and test pilot for the United Air Lines Transport Corp., outlined the flight test system employed by United. Explaining the various steps in the test procedure, he enumerated point by point the thorough procedure which has been evolved in air line practice for the

The SAE Diesel Engine Activity is cooperating with the ASME Oil & Gas Power Division in presenting the

NATIONAL OIL & GAS

• PROGRAM •

THIS is the second of the SAE Regional Meetings which, together with the July "Summer Meeting" issue of the SAE Journal, will "bring the summer meeting to the members," as announced in the May, 1942, SAE Journal. Diesel engine papers originally scheduled for the SAE Summer Meeting will be among the papers presented as the contribution of the SAE Diesel-Engine Activity under the direction of H. L. Knudsen, SAE vice president representing Diesel-Engine Engineering and G. C. Wilson, meetings chairman, Diesel-Engine Activity.

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WEDNESDAY, JUNE 17

12:00 Noon — ASME-SAE Luncheon

12:00 Noon — Ladies Picnic Luncheon

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2:00 P.M. — Engine Design (ASME)

Chairman, E. J. Kates

Bearings for Diesel Engines
— A. B. Willi, Federal-Mogul Corp.

Load Relations in Bolted Joints
— T. J. Dolan, University of Illinois.

The Mercedes-Benz Aircraft Engine
— R. W. Young, Wright Aeronautical Corp.

6:30 P.M.
"Get Acquainted" Buffet Supper

"Gay-Nineties" atmosphere, barbershop quartet, and "corn-fed" entertainment

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THURSDAY, JUNE 18

9:00 A.M. — Powerplants (ASME)

Chairman, Lee Schneitter

Developments in Closed Cooling Systems
— J. W. Bostwick, Fairbanks, Morse & Co.

Heat-Recovery Possibilities of Diesel Engines
— F. P. Grutzner, Fairbanks, Morse & Co.

Power Pulsations between Synchronous Generators
— Troels Warming, Nordberg Mfg. Co.

Design of Internal-Combustion-Engine Powerplants
— G. C. Boyer, Burns & McDonnell Engineering Co.

9:00 A.M.

Oil-Control Symposium (SAE)

Chairman, G. C. Wilson

Symposium: "The Control of Lubricating Oil Consumption in High-Speed Diesel Engines," led by Max Roensch, Chrysler Corp., who will outline the general problems in the first paper.

THE ENGINE

Piston Rings and Oil Control in Two-Cycle High-Output Diesel Engines
— F. Glen Shoemaker, General Motors Corp.

Oil Consumption Control in the Four-Cycle Automotive Diesel Engine
— A. T. Stahl, Mack Mfg. Corp.

Oil Control in Radial Diesel Engines
— W. M. McLaurin, Guiberson Diesel Engine Co.

PISTON RINGS

Engineering Piston Rings for High-Speed Diesel Engines
— Paul S. Lane, Muskegon Piston Ring Co., and Stuart Nixon, Sealed Power Corp.

Recent Development in Piston Rings for High-Speed Diesels
— W. B. Sawers, American Hammered Piston Ring Division, Koppers Co.

Piston-Ring Problems in High-Speed Diesel Engines
— Macy O. Teetor, Perfect Circle Co.

ASME 15th POWER CONFERENCE

Hotel Pere Marquette, Peoria, Ill.

June 17-19

PISTONS

Aluminum Pistons in High-Speed Diesel Engines
–P. B. Jackson, Aluminum Co. of America.

Some Solutions for Diesel Piston Problems
–Fred Zollner, Zollner Machine Works.

LUBRICATING OIL

Developments in Diesel Lubricating Oils and Their Effect on Oil Consumption
–C. G. A. Rosen, Caterpillar Tractor Co.

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12:00 Noon Ladies Bridge Luncheon

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2:00 P.M.
Operators' Roundtable

Chairman, C. E. Beck (ASME)

Associate Chairman, W. A. Parrish (SAE)

Operation and Maintenance under Wartime Conditions
–Lead-off talks by J. B. Harshman, Stanolind Pipeline Co.; C. U. Pollard; E. R. Spencer, Cooper-Bessemer Corp.; Lee Schneitter, Ebasco Services, Inc.; R. T. Sawyer, American Locomotive Co.; L. Downing, Rock Island Railroad; A. B. Willi, Federal-Mogul Corp.

●

7:00 P.M. Banquet

Toastmaster, C. G. A. Rosen

This Business of War
–Col. Willard Chevalier, Publisher, "Business Week," and vice-president, McGraw-Hill Publishing Co.

Equipment and Scientific Exhibits

Arrangements for an equipment and a scientific exhibit to be held in the Hotel Pere Marquette in conjunction with the meeting, have been completed. More than 30 manufacturers and users will display equipment.

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FRIDAY, JUNE 19

9:00 A.M. Combustion (ASME-SAE)

Chairman, C. G. A. Rosen (SAE)

Associate Chairman, W. L. H. Doyle (ASME)

Excess Air and BMEP
–P. H. Schweitzer, The Pennsylvania State College

Instrumentation in Engine Combustion Research (accompanied by film showing detonation phenomena)
–E. W. Landen, Armour Research Foundation, and L. A. Blanc, Caterpillar Tractor Co.

Effect of Diesel Fuel on Exhaust Smoke and Odor
–R. S. Wetmiller, The Texas Co., and Lt. L. E. Endsley, Jr., U. S. Army Engineers

The Positive-Displacement Supercharger
–John L. Ryde, McCulloch Engineering Co.

●

2:30 P.M. Diesels in Action

Proving-ground demonstration of diesel-powered Caterpillar tractors and Le Tourneau earth-moving equipment

5:30 P.M. Old-Style Illinois Fish Fry

For Banquet, Buffet, and Fish-Fry reservations, write L. P. Weiner, chairman entertainment committee, P. O. Box DD, Peoria, Ill. Banquet, $3; Fish Fry and Buffet, $1.50 each. No charge for Proving-Ground Demonstration. For room reservations, write Hotel Pere Marquette.

$1 registration fee for SAE and ASME members; $2 for non-members. Registration 10:00-12:00 A.M., Wednesday, June 17.

inspection and checking of each instrument, control and piece of equipment in the airplane to be flight tested. Pre-flight ground checking of component parts helps to cut down time required for testing in the air, Speaker Johnson pointed out, thereby reducing the cost of flight testing.

After a pre-flight inspection of the plane and engine, tests are made by separate flights, the flyer said. Report forms on all instrument and controls are checked and filled in and at the conclusion of the second flight, both the pilot's test form and the first officer's instrument check sheet are delivered to the crew chief who becomes responsible for the correction of all items listed as needing attention.

Mr. Johnson, who illustrated his talk by instrument board and control slides, declared that the test procedure had greatly minimized the amount of flying required to complete a test. Risk has been reduced to the very minimum, he said.

Departing from Mr. Johnson's more technical discussion, E. D. McGlone, United Air Lines display director, whose hobby is aerial photography, captivated his audience with a remarkable series of strikingly beautiful Kodachrome slides of transport planes in flight from coast to coast. Mr. McGlone, in a talking tour, took SAE members and guests on an imaginary flight from New York to San Francisco, interspersed with "behind-the-scenes" pictures depicting operating activities of ground personnel contributing to the success of the flight. He stressed the growing economic importance of air express by showing pictures depicting a variety of odd and interesting shipments by plane.

Another in the popular series of "social half-hours" preceding the dinner meeting, was sponsored by the United Air Lines under the direction of R. D. Edwards, Chicago station manager, United Air Lines, who was technical chairman for the meeting which was opened by Len Gilbert, Section chairman.

Reveals Bomber Brake Lining Good for Only Six Landings

▪ Pittsburgh

THAT brake linings of big bombers have to be changed after only six landings, was brought out in discussion of Byron H. Shinn's paper on aeronautical brakes, wheels, and tires before the Pittsburgh Section, March 24.

Mr. Shinn, a nationally-known expert on brakes, with Firestone Tire & Rubber Co., explained how the lessons learned from aircraft braking equipment may be applied to trucks and cars.

B. H. Eaton, Bell Telephone Co. of Pa., and R. M. Welker, Gulf Oil Corp., stressed the importance of proper grease seals and servicing in the maintenance of airplane wheels to prevent brake failures due to grease on the linings.

Questions were raised concerning the possibilities of using salt-cooled airplane brakes, following the principle of salt-cooled valves; abrasion of airplane tires when landing; and whether the use of retractable wheels tend toward use of smaller tires. In answer to the last question, Mr. Shinn said that larger wheels have many advantages for braking and smooth landing.

Turn to page 38

"When Hitler put this war on wheels he ran it straight down our alley. When he hitched his chariot to an internal-combustion engine he opened up a new battlefront . . . a front that we all know well. It's called Detroit." Lt.-Gen. Brehon B. Somervell, Services of Supply, War Department

The Army's "A" flag will be fluttering over plants where SAE members are hard at work turning out munitions to beat the Axis. Under-Secretary of War Patterson has named SAE member Lt.-Gen. William S. Knudsen, Army director of production, as chairman, Board of Awards.

Patent Probe Shuns Patents

ENGINEERS have become confused by the turn taken of the Senate Patent Committee's investigation of the U. S. patent laws. Reason:

S.2303 (sponsored by Senators Bone, O'Mahoney, and LaFollette) has nothing to do with patent law as such or even our patent system, but with *contractual agreements* between the inventor and someone or a corporation entering into a license agreement.

Practically all of the testimony offered to date has disclosed real and alleged abuses of anti-trust legislation in connection with such *contracts*. The Senators seek to write into the patent laws conditions and regulations covering contracts.

Based on Article I, Section 8, of the Constitution, the American patent system has been hailed as the most liberal, invention-inviting system of the world.

A short-term monopoly is given to an inventor of a "new and useful device," for example. The inventor may refuse to sell, or he may sell either exclusive or limited rights in his invention.

A vehement sponsor of the rights of the small business man, Thurman Arnold, who is leading the attack on the patent system, suffered a number of boomerangs during the early days of the hearing. Several witnesses testified that their small businesses were based on patents. He also stirred up front-page news when he disclosed monopolistic practices which should have been prevented by anti-trust laws. He invoked these statutes in getting consent decrees from a number of large companies which had pre-war deals on German patents.

Early evidence given at the hearings, furthermore, disclosed that our patent laws actually have encouraged inventors and industrialists of other countries to bring their best inventions here for American disclosures.

Our government and its contractors have the right to use any invention, whether protected by a patent or not. It also has seized enemy patents.

"Stockpiles" Of Knowledge

In several of his series of incisive, comprehensive reports, SAE Member Zay Jeffries, chairman of the Metals & Substitution group, Advisory Committee on Metals & Minerals, National Academy of Sciences, urges:

"Hasten the accumulation of stockpiles of knowledge."

Stockpiles of critical materials can be saved by everyone getting acquainted as soon as possible about the behavior of substitutes so they can be used promptly, the National Academy says.

ASC Seeking Engineers

WHILE the ten-million-man-Army talk continues in Washington unabated, the Army Specialist Corps is getting itself organized to enlist men not eligible for active military service because of age or physical disability.

Organized under Dwight F. Davis, a former assistant secretary of war, the Corps is being set up to:

1. Receive from the Army requests for "all classes" of engineers and other professional and artisan specialists,
2. Interview men for these jobs,
3. Classify them as officers and specialists of various ranks,
4. Make these men available to the military arms and services needing them.

ASC will be a corps of uniformed civilians, and a branch of the War Department under the supervision of the Secretary of War. A distinctive uniform, similar to that of Army officers and enlisted men, has been approved by the War Department.

Eligibility:

- Citizen of the United States,
- Education, training, and experience will be the basis of selection.

Appointments will be made only to meet specific needs submitted to ASC by the Army.

ASC men will work under the commanding officer of the unit to which they are assigned, and once enlisted will serve for the duration and six months thereafter—unless discharged before.

Rank and pay will be, in general, that of officers and enlisted men.

Applications are available from the Army Specialist Corps, Washington, and are to be filled out in duplicate. As soon as a man is needed for a specific task, ASC will look over its applications, arrange an interview with the prospects in that field, make a choice, induct or commission him, and turn him over to the Army.

✪

Production Men To Advise Military On Plant Facilities

Special industrial consultants in the Bureau of Industry Branches, WPB, have been made available to the Armed Services and Maritime Commission to increase the efficiency in filling war orders.

The consultants, all of whom have had long production engineering experience in their respective industries, will inform the Army, Navy and Maritime Commission procurement executives about existing facilities of a number of smaller industries.

Consultants appointed to this service represent the following manufacturing industries:

- Household appliances.
- Stoves.
- Pulp and paper machinery.
- Metal furniture.
- Office machinery.
- Wood working machinery.
- Printing machinery.
- Lead products.
- Railroad car building.
- Builders hardware.

Subcontracting By Mail Order

OUT in Chicago, WPB and the National Association of Manufacturers are giving an intensive trial to the Stanley Plan, originated by James S. Stanley, described as "an idea man," who failed to get his former boss enthusiastic about "taking arms jobs to the machines" instead of trying to take the machines to the jobs. Released by WPB's Contract & Distribution Chief Walter H. Wheeler, he was hired by WPB's Director of Production, William H. Harrison.

The Stanley Plan:

1. A weekly mail order Directory of Contract Opportunities lists:
   - Several hundred armament jobs contracted for by more than 30 manufacturers,
   - Twenty-five types of machines, and miscellaneous types, 26 groupings in all. These are coded by the alphabet. Sizes and styles total more than 3000.
   - Coded index of the jobs,
   - Machine-hour code,
   - Tolerance code, and
   - Overall dimension code,
2. After a potential subcontractor gets his copy of the Directory, he is asked to code all his machines as instructed.

This coding matches, alphabetically, the Index to Jobs. It discloses at once which jobs can be handled by the machines available.

3. Having found the type of work available, the manufacturer writes the prime contractor, asking for drawings and giving his list of machinery in code.
4. He asks the prime contractor to send the complete Breakdown List, which includes dimensions, tolerances, materials, etc., as well as the time required by each operation.

The Chicago program includes daily lectures explaining the code.

Should the experiment prove successful, Mr. Harrison is expected to swing a nation-wide program of the Stanley Plan to get all available machines doing war work.

SAE Men Confer on Inventions

Lt.-Gen. William S. Knudsen and Charles F. Kettering (left and center), are among the hundreds of SAE members who are devoting their full time to the winning of the war. They are conferring with Patent Commissioner Conway P. Coe and Dr. William D. Coolidge, General Electric vice president (both standing) and Admiral A. J. Furer, coordinator of research, U. S. Navy. Mr. Kettering is chairman of the National Inventors Council, of which Commissioner Coe and Dr. Coolidge are members

"Vanadium 1% Dream" Is Being Redreamt

WILL O' THE WISP amateurs dabbling in the highly technical field of metallurgy, are again on the loose with the dream-lit notion that industry and government have been remiss in not salvaging the vanadium content in Venezuelian crude.

The facts:

- Venezuelian crude petroleum contains from 0.5 to 1.25% vanadium.
- For a number of years this vanadium has been salvaged from steamships burning Venezuelian oil. The smokestacks and flue boilers are cleaned at the New York end of the Caribbean run, and turned over to several salvage organizations. It has been a small-scale operation, because of the small amounts of flue dust and sludge available, and the relatively high cost of reduction.
- A great deal of research during the past 15 years has been done by the industry. The government has been furnished with all the data and results.
- Today, with the uncertainty of shipping schedules, the problem of collecting enough of the sludge in one place is far more complex than during peacetime.

Industry and the government are working together on the 99% in view of the scarcity of vanadium, and are not impressed with schemes to make the "1% dream" come true.

Tin Smelter Gets Priorities Help

Started as an 18,000-ton capacity tin smelter, a government project "somewheres" in Texas is being rushed to completion with a series of priorities orders and other WPB assistance.

Already plans have been changed to up capacity to 52,000 tons to process Bolivian tin ores (output 46,027 tons, 1940 estimate) and a stock of Pacific and other ores on hand.

Average annual U. S. consumption of primary tin (1935 to 1940) was 67,480 long tons, and about 17,500 long tons of secondary tin.

Other tin smelting capacity of U. S. is said to be "negligible."

Trouble-Shooter Gets Own Medicine

TROUBLE-SHOOTING war production is one of the basic functions of WPB, but the organization has grown so huge (12,000-odd employees) and complex (some 2000 units) that Dr. Luther Gulick has been put in charge of the new Office of Organizational Planning to trouble-shoot WPB itself.

OOP's function:

- Recommend to Donald M. Nelson, WPB's chairman, methods to coordinate and simplify controls;
- Study organizational relationships between WPB and the Army, Navy, and Maritime Commission;
- Try to decentralize WPB's authority and responsibilities both in Washington and in the 13 regional offices (see "Thirteen Babies Born to WPB," p. 32).

Dr. Gulick, director of the Institute of Public Administration, Columbia University, has served Lt.-Gen. Brehon B. Somervell as an adviser on supply organization, and has also been consultant to the Treasury, National Resources Planning Board, and other government agencies.

Wide twilight zones between administrative functions have resulted in contrary decisions by several executives on the one hand, and have stimulated buck-passing on the other.

WPB Launches Scrap Drive

SCRAP materials—"mines above ground"—are in for intensive exploitation by WPB more than a year after the first program of "scrap drives" was developed in considerable detail. "Lack of authority to proceed" was the vague excuse offered for the long delay.

In one of a series of meetings being held throughout the country with the cooperation of the SAE and scores of national and local engineering societies and groups, Paul Cabot, deputy chief, Bureau of Industrial Conservation, WPB, outlined the program:

- To develop programs of conservation and substitution;
- To aid the Army and Navy to change government compositions of materials to save critical materials;
- Simplification, by reducing the number of sizes and styles; and
- Salvage of critical materials, both in factories and from homes, farms, auto "graveyards," shops, etc.

Despite great pressure on steel mills to increase output, scores of mills have been shut down from time to time because of the lack of scrap to make up heats.

Normal volumes of rubber scrap (largely worn tires) have been cut to the diminishing point because motorists and truck and bus operators are conserving their tires and recapping whenever permitted to do so.

Aluminum collection from the public got a number of setbacks, despite widespread cooperation of housewives. Reason No. 1:

Failure to make proper arrangements to have the aluminum scrap sorted as to approximate alloy content. Reason No. 2:

Failure by WPB to authorize enough smelting permits for melting the scrap. This is being rectified, and current reclamation is running:

98% aluminum alloy, 20%
No. 12 aluminum alloy, 25%
Deoxidizing aluminum (for steel mills) 55%

Wide OPA publicity on scrap aluminum price ceilings cooled the first-flush ardor of junk dealers to cooperate. As a result, OPA proceeded to requisition scrap from dealers who refused to sell at "normal profit margins."

Typical results:

- 178 obsolete World War I tanks are being cut up for scrap. Scores of newer tanks, wrecked in maneuvers, are being salvaged.
- Sample assays of steel mill slag dumps indicate about 0.05% of steel. Total U. S. estimate runs about 1,000,000 tons of recoverable steel. Expensive, but steel is scarce.
- Several old steel structure buildings are being torn down to recover scrap.
- Rochester, N. Y., steel company melted six automobiles (stripped of engine, transmission, rear axle, upholstery, plastic parts, radiators, tires, glass, etc.) as demonstration of the feasibility of melting whole cars in oversized cupolas. Metallurgists are analyzing the melt.
- Thousands of tons of condemned structures (bridges, rails, etc.) are being cut up for scrap.
- High hopes for important scrap are held by the Bureau in a program to stimulate other companies to emulate the project of Bullard Co., machine tool builders of Bridgeport, Conn., headed by Robinson Bullard. The case study:

About 250 freight cars of salvaged materials a year, including:

15,000,000 lb of iron borings and steel turnings; a special briquetting plant is used.

25,000 gal of cutting and lubricating oil is reclaimed.

125,000 lb of cotton waste is salvaged.

- Automotive companies, long administrators of shop scrap salvage, will be studied by the Bureau in developing the shop salvage program, the SAE Journal was told.

Buys Railroad For Its Scrap

TO grab 15,000 tons of steel and other metal scrap, the Metals Reserve Co. of the Reconstruction Finance Corp. has bought the metallic inventory of the abandoned New York, Westchester & Boston Railroad for $423,600. This historic incident in scrapology was masterminded by WPB's Bureau of Industrial Conservation.

Inventory:

5567 tons of rail, much of it good enough to be relaid if needed;
408 tons of angle iron and bars;
437 tons of tie plate;
10¼ tons of track bonds;
256 tons of bolts, spikes, nuts, locks, etc.;
139 tons of frogs, switches and other high alloy metal.
218 tons of overhead steel wire and fittings;
100 tons of copper and fittings;
96,000 ft of lead covered cable, 241 electrical transformers, and several hundred tons of miscellaneous scrap.

Vehicle Operators Get In The Scrap

The Industrial Salvage Section, Bureau of Industrial Conservation, WPB, chose a man of practical experience when it appointed SAE Member L. C. Greenebaum to head its Transportation Division. President Greenebaum's company, Metropolitan Distributors, Inc., New York, had already salvaged 5 tons of steel and iron, 4000 lb of lead, and nearly $3000 of parts in "junkers" in the garages of its 1700 vehicle fleet. Volunteer Chief Gus Fuhring (left) is being congratulated by Vice President Robert D. Sidel for conducting a successful campaign. A message from Mr. Greenebaum is being read at technical meetings of SAE Sections urging transportation and maintenance engineers to salvage scrap of all kinds and hurry it back to the processors through local junk dealers.

A. I. Henderson Named Materials Division Head

William L. Batt, for 28 years a member of SAE, and for more than two years head of the nation's effort to provide materials for winning the war, has resigned as director of the WPB Materials to devote his whole time to his other war assignments.

A. I. Henderson, deputy director, becomes head of this important division after equally long service in various administrative assignments on materials.

Few other changes are expected, although C. E. Adams, chief of the Iron & Steel Branch, may be forced to resign because of ill health.

Mr. Batt continues as chairman of WPB's Requirements Committee, member of the British-American Combined Raw Materials Board, chairman of the U. S.-Canada Coordinating Committee, and coordinator of the Russian Aid program.

In July, 1940, Mr. Batt was appointed deputy commissioner of the Industrial Materials Department, Advisory Commission to the Council of National Defense, when SAE Member Edward R. Stettinius, Jr., was appointed commissioner by the President.

Tin Is Today's Cinderella Metal

TIN, the price of which was protected in peacetime by international agreements limiting production and other cartels, became a "rare" metal when the Japs struck at Pearl Harbor. A measure of its scarcity:

• Silver and gold are proposed as substitutes. (Average 1940 price of tin was 50¢ per lb; silver $4.20 per lb, and gold $420 per lb.)

Background:

Its early history lost in antiquity, tin had become a full-fledged alloying material in the days of Pliny at the beginning of the Christian era. Still earlier records called tin "dross," and *diabolus metallorum* – devil among metals.

Four-fifths of the world's tin supply is at the other end of long sea lanes, and about 70% normally came from Malaya, Dutch East Indies, Thailand (Siam), and French Indo China – sources in the heart of the Battle of the Pacific. Normal Bolivian supplies, less than one-fifth of the world's sources, account for the balance.

Bolivia's tin mining history is a gruesome chapter of gangsterism stemming from the early 1600's when followers of Francisco Pizarro fought for Potosi Hill, the world's richest silver deposit. Only barrel-chested Indians can work at the 15,000 elevation in the Andes. In those days tin ores were neglected, but the mine dumps, rich in tin, are being worked with redoubled energy.

The average of the 1935 to 1940 period shows the following uses of tin in the U. S.:

USE	PER CENT
Tin and terne plate	52½
Solder	15½
Bronze	7½
Tubes and foils	7
Babbitt	5½
Other uses	12

WPB has exerted a great deal of pressure to reduce the amount of tin in all products. Manufacturers of tinned products were called to Washington more than a year ago and urged to reduce the amount of the metal in their goods.

Following a series of these meetings and several specific warnings, the Tin Order (M-43, Dec. 18, 1941) nailed down civilian use in the strictest materials order up to that date. A series of amendments and Limitation Orders, and inventory control provisions followed.

Conservation Order M-43-a (March 17) ordered the Army, Navy and certain other government agencies *usually excepted* to conform to a list of tin use restrictions.

More than a year ago, the National Research Council of the National Academy of Sciences submitted to OPM a factual survey of the tin situation, predicting its increasing scarcity, and suggesting substitution possibilities. Silver and gold were among the suggestions made.

After months of work, based on the rich background of SAE and ASTM committee work on alloys, WPB issued the Emergency Specifications for Bronze Castings (See p. 27, SAE Journal, May).

Two Emergency Alternate Specifications, one for solder and another for babbitt metal, have been issued to the industries using these materials in the government's desperate effort to save today's Cinderella of metals for absolutely essential uses. (See table at right). Tentative bronze specs, p. 34.

Emergency Alternate Provisions in Tentative Standard Specifications for Soft Solder Metal (B32-40T)

Due to the fact that the government has forbidden the use of solders containing more than 30% tin (except by special permission of appropriate government board) typical tin-lead alloy compositions as printed in the opposite column:

30 – 70	15 – 85
25 – 75	10 – 90
20 – 80	5 – 95

In addition to the above tin-lead alloys the following alloys are suggested as substitute solders:

Alloy	Tin,[a] %	Lead, %	Bismuth,[a] %	Silver,[a] %	Antimony, %	Copper, %
1	25	remainder	0.5	0.5	0.5 max.	...
2	20	remainder	15	none	...	...
3	20	remainder	10	none	...	...
4	20	remainder	3	1.5	...	...
5	15	remainder	5	1.5	0.5 max.	0.5 max.
6	10	remainder	5	2.0	0.5 max.	...
7	0.65 to 0.85	remainder	none	0.25	...	...
8	none	remainder	none	1 to 5	...	0.5 max.

[a] The permissible variations in these elements shall be as follows: Tin: nominal —0.50, except in the case of alloys 7 and 8; bismuth: plus or minus 0.25; silver: plus or minus 0.10.

The above listed typical tin-lead alloy compositions and the eight alternate alloys are hand and dipping solders and cannot be used for wiping.

Properties

Composition					Melting Range			
					Solidus		Liquidus	
Tin	Lead	Bismuth	Silver	Antimony	F	C	F	C
30	70	...	...	...	361	183	486	252
25	75	...	...	...	361	183	509	265
20	80	...	...	...	361	183	523	273
15	85	...	...	...	437	225	543	284
10	90	...	...	...	527	275	567	297
5	95	...	...	...	576	302	592	311
25	bal.	0.50	0.50	...	...	...	...	...
20	65	15	...	...	338	170	422	216
20	70	10	...	...	396	202	460	238
15	bal.	5	1.50	0.5 max	419	215	496	258
10	bal.	5	2	0.5	419	215	529	276
20	bal.	3	1.50	0.5	419	215	496	258
0.75	bal.	...	0.25	0.1 max	605	...	615	...
...	95	...	5	...	579	304	715	380
...	96	...	4	...	579	304	653	345
...	97.50	...	2.50	...	579	304	579	304
...	98	...	2	...	579	304	590	310
...	99	...	1	...	579	304	604	318

Emergency Alternate Provisions in Standard Specifications for White Metal Bearing Alloys Known Commercially as Babbitt Metal (B23-26)

Due to the fact that the government has forbidden the use of White Metal Bearing Alloys containing more than 10% tin (except by special permission of appropriate government board) the following standard alloys may be employed:

Table 1—Chemical Requirements

Alloy Grade	Tin %	Antimony %	Lead %	Copper %	Silver %	Arsenic max %
No. 7	10	15	75	0.50[a]		0.20
No. 8	5	15	80	0.50[a]		0.20
No. 9	5	10	85	0.50[a]		0.20
No. 10	2	15	83	0.50[a]		0.20
No. 11	...	15	85	0.50[a]		0.25
No. 12	...	10	90	0.50[a]		0.25
No. 13	2.0	15	balance	0.25	2.5	...
No. 14	0.75	12.75	83.5	...	...	3.0
No. 15	0.9 – 1.25	14.75 – 15.5	82.5	0.4 – 0.6	...	0.6 – 1.1
No. 16	10	12.5	77	0.5	...	...
No. 17	6	10	84	¼ max	...	...
No. 18	1.4	16.5	80.5	0.4	...	1.2

Properties

	Brinell Hardness		Solidus		Liquidus		Pouring Temperature	
	at 20 C	at 100 C	F	C	F	C	F	C
7	22.5	10.5	464	240	514	268	640	328
8	20.0	9.5	459	237	522	272	645	341
9	19.0	8.5	459	237	493	256	620	327
10	17.5	9.0	468	242	507	264	630	332
11	15.0	7.0	471	244	504	262	630	332
12	14.5	6.5	473	245	498	259	625	329
13	...	...	...	...	...	...	...	...
14	22	15	469	243	563	295	689	365
15	...	...	...	...	...	...	...	...
16	27.5	13.6	471	244	495	257	621	327
17	...	...	...	...	...	...	...	...
18	29	16	...	...	...	...	875	468

They're Saying in Washington...

Unheralded WPB Reorganizations

DISSOLUTION of WPB's Labor Division, organized by Sidney Hillman, who was also associate director general of OPM, has begun. *Rigor mortis* hasn't set in yet, but there's not much left of the never-too-powerful *advisory* set-up. News and views:

- It is now the Labor Production Division, headed by youthful Wendell Lund, assigned to the broad and somewhat mystic job of directing the country's "labor relations." He has what is left after a series of amputations:
- The powerful National War Labor Board eclipsed the division's dimming glimmer just as soon as it swung into action a few months ago.
- Paul V. McNutt's expansive War Manpower Commission has taken over the Training-Within-Industry program *in toto* – including the best talent which devised and executed a program which has been helpful in the armament program. Also the labor procurement program.
- Industry Operations branches (such as Kanzler's automotive) paid scant heed to the division, which was developed along geographical lines and split as to CIO and AF of L problems, which – as far as Mr. Kanzler was concerned – were *automotive* labor problems, for example.
- Labor leaders mistrusted Mr. Hillman from the start, and missed the opportunity of a lifetime to saddle industry with labor-in-management, *a la* Walter Reuther.
- Shot-in-the arm medication will be tried, but the patient may prove to be too weak to stand the stimulation.

★

The Division of Purchases has all but "gone west" – and in Washington that means to the Army and Navy. Douglas MacKeachie has been in the Army for several months, as deputy director of procurement and distribution, Services of Supplies, and Houlder Hudgins is holding what's left of that bulwark as acting director. A score of ranking men of the division are in Army procurement, Quartermaster Corps, or the Signal Corps, and several have been transferred to the Navy. Soon Mr. MacKeachie will be a colonel and may become World War II's "Hell an' Maria" Dawes.

★

WPB's Contract Distribution program is all but dead. Perhaps no OPM-WPB effort got so much publicity for so little accomplishment.

- The "bright hope" of the effort in so far as getting action was concerned, was the Stanley Plan (see "Subcontracting By Mail Order", p. 29). But James S. Stanley was released, then rehired by the WPB Production Division, whose boss, William H. Harrison, is watching for results of the experiment in Chicago.
- Each of the more important Industry Branches of the Division of Industry Operations has a conversion chief. Mr. Kanzler handles that function himself for the Automotive Branch.

Thirteen Babies Born to WPB

WPB has given birth to thirteen baby WPB's. Mother and children are doing as well as can be expected in such obstetrical fantasia, and six guardians have already been named to rear up their individual charges:

- Detroit, Ernest Kanzler, who is also head of WPB's Automotive Branch;
- Chicago, Joseph L. Overlock;
- Cleveland, John C. Virden, electrical equipment manufacturer;
- Philadelphia, Orville H. Bullitt, investment banker;
- Boston, Walter H. Wheeler, formerly head of WPB's Contract Distribution effort;
- Atlanta, Frank H. Neely, and
- New York, John P. Maguire, textile factor.

Kansas City, Dallas, Denver, San Francisco, Minneapolis, and Seattle make up the list.

Objective:

- To make field decisions on priorities;
- To administer compliance;
- To cooperate with the War Manpower Commission in solving labor shortage problems, and to solve layoff problems;
- To help manufacturers to get contracts, materials, and equipment.

However, the maternal parent (WPB) remains boss in setting overall policies and making legal interpretations.

WPB spokesmen have admitted that the present regional set-up has been little more than clerical. Except for trivia, questions had to go to Washington, and usually the questioneering industrialists had to go there finally – when extensive correspondence failed to get action.

WPB expects its offspring to be sufficiently authoritative to become lusty. Some foresee troubles which will come of the Boston, Chicago, and San Francisco children, for example, handing down three different decisions to the same problem posed by three plants in these localities.

WPB is 12,000 strong in Washington, and no dieting is in sight. Most of the 2000-odd different units are looking for more men. Some of the regional staff personnel will be taken from Washington, but most of them will be local men.

It looks like "several thousand" experts and specialists will be added to the rolls of WPB by several of the obstetricians who handled the decentralization of WPB.

✪

Arms Sales Freed From Price Ceilings

Amendment to OPA's General Maximum Price Regulation excludes armament sales to the government. The sweeping regulations were held by Army, Navy, and Merchant Marine officials to "interfere" with essential war production.

Most parts and subassemblies are also exempt, giving the government contracting agencies latitude in negotiating.

Already the government has renegotiated millions of dollars' worth of contracts, usually downward.

Victory-Grams

AFTER JUNE 1, ALLOY IRON AND STEEL PRODUCTION WILL BE SUBJECT TO MONTHLY MELTING SCHEDULES OF WPB.

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MARCH MACHINE-TOOL SHIPMENTS HIT ALL-TIME HIGH OF $98,400,000 WHEN TOTAL OF METAL WORKING TOOLS REACHED $108,600,000 FOR MONTH. BUT TOOL ORDER (E-1-b) SETS ALL OF THEM ASIDE FOR WAR WORK.

★

SAFETY EQUIPMENT WAS HIT BY WAR NEEDS, A WPB REGULATION (MAY 5) DISCLOSED. CRITICAL MATERIALS ARE NOT PERMITTED IN MANUFACTURE OF THESE ITEMS UNLESS THEY ARE FOR ARMY, NAVY, OR MARITIME COMMISSION.

★

INVENTIONS TO WIN THE WAR ARE ON THE UPGRADE: OF 26,589 LETTERS RECEIVED BY NATIONAL INVENTORS COUNCIL, ABOUT 12,000 WERE INVENTIONS. GOOD IDEAS ARE SUBMITTED TO 12 COMMITTEES OF EXPERTS IN SPECIAL FIELDS FOR FURTHER STUDY.

★

OUTBOARD ENGINE BUILDERS CAN NOW SELL ONLY TO GOVERNMENT AGENCIES.

★

"DEFENSE ORDERS" (PRIORITY REGULATIONS) AMENDED TO INCLUDE: CZECHOSLOVAKIA-IN-EXILE, FREE FRANCE, ICELAND, TURKEY.

★

ASK LOCAL WPB OFFICE FOR A NEW BOOKLET EXPLAINING HOW TO DETERMINE COSTS UNDER GOVERNMENT CONTRACTS.

★

COPS AND MAIL CARRIERS ARE NOW "WALKING TEST LABS" FOR RUBBER HEELS IN WASHINGTON. NEW RECLAIMED MATERIALS ARE ON TRIAL.

★

RED CROSS MAY GET AUTOMOBILES UNDER NEW RULING BY OPA's LEON HENDERSON.

★

WATCH FOR RAILROAD PASSENGER TRANSPORTATION RATIONING, ODT's JOSEPH B. EASTMAN WARNS. GASOLINE RATIONING AND RUBBER SHORTAGE RESPONSIBLE FOR HEAVY SCHEDULES – TROOPS AND "OFFICIAL BUSINESS" COME FIRST.

Turn to page 33

Vital War Transportation Program Launched in Communities by ODT

A NATION-WIDE war transportation program, destined to affect every automobile, truck, and bus owner in the country, is being organized by the Office of Defense Transportation.

Objectives announced by ODT Director Joseph B. Eastman:

1. To prolong the life of all transportation facilities now in use, and

2. To increase the efficiency of mass transportation.

Reasons:

- The rubber shortage, and
- Retooling of the automotive industry for armament manufacture, hence no new vehicles or parts.

The conservation plan, developed by the Michigan State Highway Department, is the basis of the program to conserve tires and parts.

The Highway Traffic Advisory Committee to the War Department will administer the program. The committee consists of:

American Association of State Highway Officials,

American Association of Motor Vehicle Administrators,

International Association of Chiefs of Police, and Public Roads Administration.

Commissioner of Public Roads, Thomas H. MacDonald, is chairman.

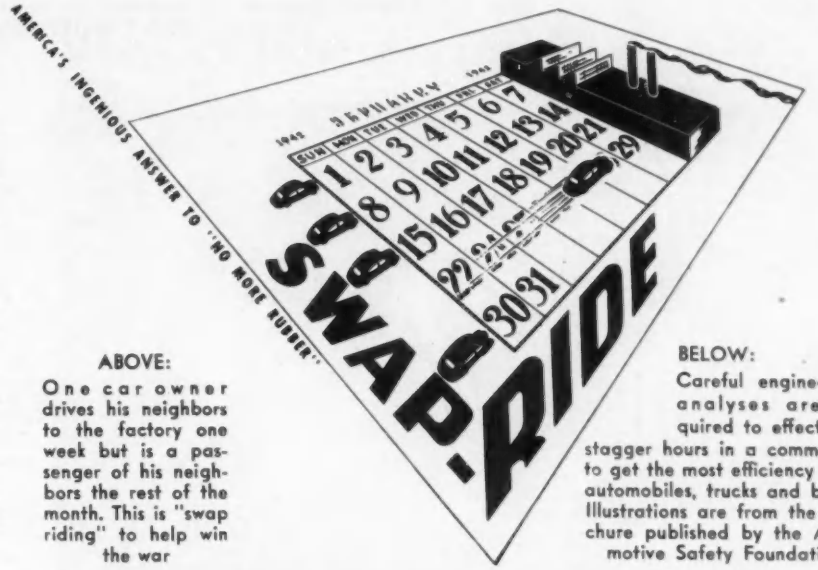
In letters to governors and mayors of cities of 10,000 population and over, Director Eastman urged prompt action in organizing each community into a coast-to-coast network of effective transportation conservation committees. Because of different working conditions and highway systems, Mr. Eastman pointed out, many communities may find it necessary to modify the plan to prevent traffic bottlenecks.

Principal methods proposed:

1. Systematic staggering of business, school, and working hours,

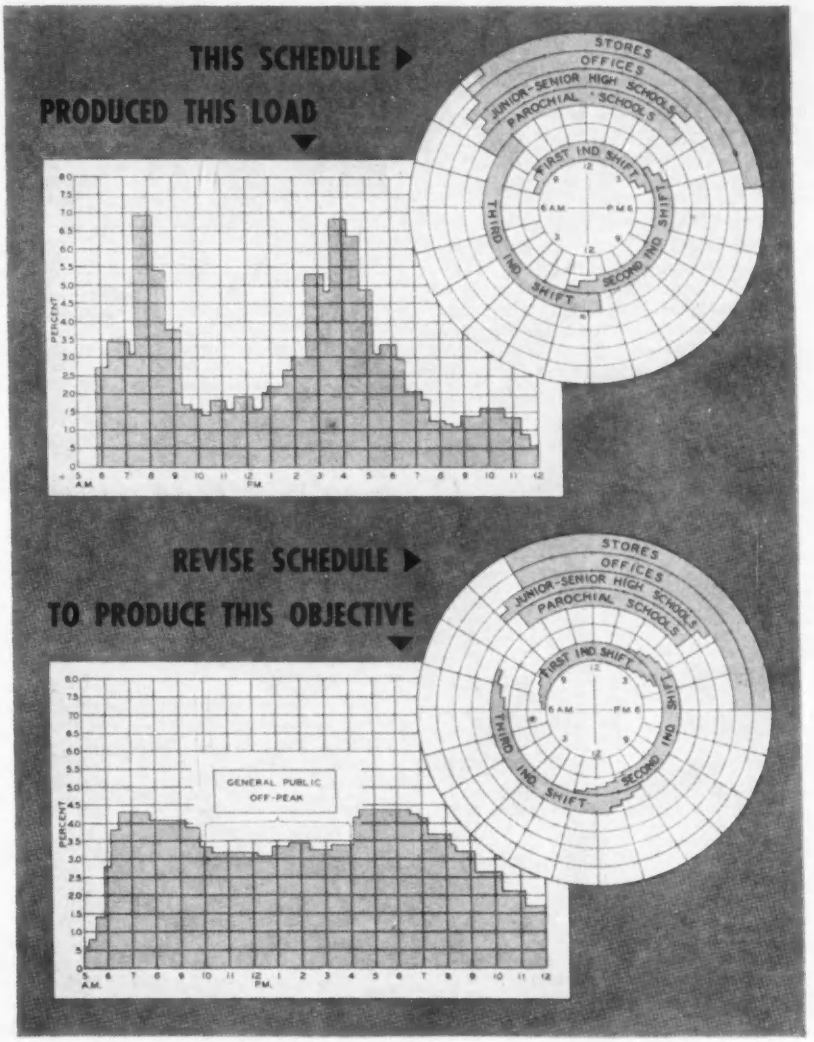
2. Group riding in private automobiles on a planned, neighborhood-by-neighborhood basis, and

3. Improved traffic regulations to promote more efficient use of cars, trucks and buses.



ABOVE: One car owner drives his neighbors to the factory one week but is a passenger of his neighbors the rest of the month. This is "swap riding" to help win the war

BELOW: Careful engineering analyses are required to effectively stagger hours in a community to get the most efficiency from automobiles, trucks and buses. Illustrations are from the brochure published by the Automotive Safety Foundation



New Specs To Save Tin Issued

NEW tools for the metallurgist and design engineer to save as much critical material as possible, have been suggested in the form four tables of present ASTM specifications and suggested substitutes.

WPB conservation experts are already talking about issuing an order based on this work, just as soon as sufficient experience is gained in testing the proposals:

Table I: Substitutes for ASTM alloys covered by Specification B-143. Purpose is to reduce the "G" compositions from 88-10-2 to 88-8-4, or to "M" materials for pressure parts.

Tables II and III: Cover ASTM Specifications B-144. Lower tin content and slightly more zinc and opening the impurity limits.

Table IV: Recommends for alloys of the Specification B-145 group. A new alloy, 5X, with same nominal compositions as the 5A, but with slightly higher physicals. Except where salt water or other extreme corrosive water is involved, the 5X can be used in place of the 4A, 4B, or 5A. Already 5X has been included as a new Grade 11 in the Federal Specifications (See p. 31.)

War Spending Accelerates

WHEN the average daily rate of war expenditure hit $99,600,000 in February, a new pattern was set in the expenditure picture.

The April total outlay reached $3.4 billion, which equaled the total wholesale value of cars and trucks manufactured in the U. S. and Canada in 1929 and again in 1941. The figure includes pay checks for the Army, Navy and defense agencies, new plants, and armaments.

The daily rate doubles that of November, a month before Pearl Harbor, and is four times that of a year ago.

UNITED STATES WAR EXPENDITURES
MONTHLY AND DAILY RATE
(In millions of dollars)

	Monthly Expenditures*	Daily Rate
July, 1940	200	7.7
August	226	8.4
September	250	10.4
October	325	12.0
November	405	16.9
December	508	20.3
January, 1941	609	23.4
February	633	27.5
March	818	31.5
April	842	32.4
May	924	35.5
June	911	36.4
July	1026	39.5
August	1196	46.0
September	1430	57.2
October	1665	61.7
November	1541	67.0
December	1996	76.8
January, 1942	2230	82.6
February	2391	99.6
March	2987 Prelim.	114.9
April	3421 Prelim.	131.6

* Revised series.

PROPOSED Tentative Alternate Bronzes

(The SAE is now working out emergency alternate specifications for the SAE Non-Ferrous metals to be coordinated so far as possible with the proposed ASTM Alternate Specifications. These will be the basis for Alternate Emergency materials to be promulgated by WPB)

Table I – B-143 (ASTM designation)

PRESENT		SUBSTITUTE	
1 A "G"	88-10-0-2	2 A	88-6-1.5-4.5
1 B "G"	88-8-0-4	2 X	87-8-1-4
		2 Y	88-8-0-4
2 A "M"	88-6-1.5-4.5	None	
2 B "M"	87-10-1-2	2 X	87-8-1-4

	1 A	1 B	2 A	2 B	2 X	2 Y
Cu	86-89	86-89	86-89	86-89	86-89	86-89
Sn	9.0-11	7.5-9	5.5-6.5	9.0-11	7.5-9	7.5-11
Pb (max.)	0.30	0.30	1-2*	0.75-1.5*	1.00	0.60
Zn	1-3	3-5	2.5-5	1-3	3-5	1-5
Ni (max.)	1.00	1.00	1.00	1.00	1.00	1.00
Fe "	0.15	0.15	0.20	0.20	0.25	0.25
P "	0.05	0.05	0.03	0.05	0.05	0.02
Other (max.)	0.25	0.25	0.35	0.35	0.35	
T. S.	40,000	40,000	34,000	36,000	36,000	40,000
Y. S.	18,000	18,000	16,000	16,000	16,000	18,000
Elon.	20	20	20	15	18	20

* Range

"G" 1 A equals QQ-B-691a Grade 5.
"G" 2 X equals QQ-B-691a Grade 6, 6 X and 5 E.A.
"M" 2 A equals QQ-B-691a Grade 1.

Table II – B-144 (ASTM designation)

PRESENT		SUBSTITUTE	
B 66	Hard Bronze	3 X	80-7-10-3
B 66	Phosphor Bronze	3 Y	84-8-8-0
3 A	80-10-10-0	3 B or 3 X or 3 Y	
3 B	83-7-7-3	None	
3 C	85-5-9-1	None	

	Hard B	3 X	3 A	3 B	3 Y	Phosphor B
Cu	remainder	77-81	77-81	81-85	82-85	remainder
Sn	7-10	6-7.5	9-11	6.25-7.5	7-9	9-11
Pb	10-15	8-11	8-11	6-8	7-9	9-11
Zn (max.)	1.25	2-4*	0.75	2-4*	0.75	0.5
Ni "	....	0.5	0.5	0.5	1.00	....
Fe "	....	0.20	0.15	0.20	0.15	....
Sb "	....	0.75	0.55	0.25	....	....
P "	....	0.05	0.05	0.03	0.2-0.5*	0.2-0.4*
Other (max.)	0.75	0.35	0.35	0.35	0.50	1.00
T. S.	....	25,000	25,000	30,000	25,000	....
Y. S.	....	12,000	12,000	14,000	12,000	....
Elon.	....	8	8	12	8	....

* Range.

3 Y equals QQ-B-691a Grade 8.

Table III – B-144 (ASTM designation)

PRESENT		SUBSTITUTE	
B 66	Medium Bronze	3 Z	78-6-15-1
3 D	78-7-15-0	3 Z	78-6-15-1
B 66	Soft Bronze	3 W	70-5-25-0
3 E	70-5-25-0	3 W	70-5-25-0

	Medium B	3 D	3 Z	Soft B	3 E	3 W
Cu	remainder	75-79	75-79	remainder	67-71	67-71
Sn	6-8	6.25-7.5	5.5-7	4-6	4.25-5.5	4.5-5
Pb	14-22	13-16	13-16	23-27	23-27	23-27
Zn (max.)	1.25	0.75	1.25	0.75	0.50	0.75
Ni "	....	0.75	0.75	....	1.00	1.00
Fe "	....	0.15	0.15	....	0.15	0.15
Sb "	....	0.75	0.75	....	0.75	0.75
P "	....	0.08	0.08	....	0.05	0.05
Other (max.)	0.75	0.35	0.35	0.75	0.35	0.35
T. S.	....	25,000	25,000	....	21,000	21,000
Y. S.	....	14,000	14,000	....	11,000	11,000
Elon.	....	10	10	....	7	7

Table IV – B-145 (ASTM designation)

PRESENT		SUBSTITUTE	
4 A	85-5-5-5	5 X	81-3-7-9
4 B	83-4-6-7	5 X	81-3-7-9
5 A	81-3-7-9	5 X	81-3-7-9
5 B	76-3-6-15	None	

	4 A	4 B	5 A	5 B	5 X
Cu	84-86	82-83.75	79-81.75	75-76.75	78-82
Sn	4.25-5.75	3.25-4.25	2.5-3.25	2.5-3.25	2.5-3.25
Pb	4.5-6	5.5-7	6.25-7.25	5.25-6.75	6-8
Zn	4-6	5.5-8	8-10	13-17	7-10
Ni (max.)	1.00	1.00	1.00	1.00	1.00
Fe "	0.30	0.30	0.40	0.40	0.40
P "	0.03	0.03	0.02	0.02	0.02
Other (max.)	0.50	0.50	0.50	0.50	0.50
T. S.	30,000	29,000	28,000	25,000	29,000
Y. S.	14,000	12,000	12,000	12,000	13,000
Elon.	20	15	15	15	18

5 X equals QQ-B-691a Grade 11.

About SAE Members

JOHN K. **CHRISTMAS** has been promoted to the temporary grade of brigadier general, Ordnance Department. He has been assigned to the Tank and Combat Vehicle Division of the Office of the Chief of Ordnance for more than a year.

Formerly vice president and general manager, **EARL R. HERRING** was elected president and general manager, Kinner Motors, Inc., Glendale, Calif.

LOUIS THOMS, a member of C. L. McCuen's central engineering staff, General Motors Corp., has been appointed a member of the SAE War Engineering Board, Chairman **J. C. ZEDER** announced. Mr. Thoms has been a member of the Society for more than 20 years.

RALPH H. McOUAT has been elected president of the Romec Pump Co., Elyria, Ohio. He had been vice president and general manager of the Pump Engineering Service Corp., Cleveland.

DAVID J. LITTLE, who was design engineer with the Livermore Corp., Detroit, is now employed at the Affiliated Engineering Co., of the same city, designing jigs and fixtures.

Wins Highest Award – for Leading Historic Bombing Raid on Tokyo

Press Association photo.

Awarded the Congressional Medal of Honor for personally leading the Army Air Forces' historic bombing raid on Japan, April 18, Brig.-Gen. JAMES H. DOOLITTLE again demonstrated the philosophy which has made him famous – "always be careful." His frequent record-breaking flights, pioneering in blind flying, and important contributions to aeronautical engineering have resulted from meticulous attention to detail. An SAE member, he took a leave of absence from Shell Oil Co. to rejoin the Army, was soon promoted to lieutenant-colonel, and recently raised to his present rank. Seen here at the White House, he is being congratulated by the President. At the left is Lt.-Gen. H. H. Arnold, Commander of the Air Forces; and Mrs. Doolittle. Gen. George C. Marshall, chief of staff, is at the right. Gen. Doolittle has addressed several SAE aeronautical meetings

Named Treasurer

C. J. Dalton

The Trailer Co. of America, Cincinnati, recently announced the election of **C. J. DALTON** as treasurer. Mr. Dalton joined this organization last year as controller. During World War I, he served with the 302nd Engineers, 77th Division, as a lieutenant.

FREDERICK C. HORNER has been appointed to the Transportation Division, Services of Supply of the War Department, in Washington. He was formerly assistant to chairman, General Motors Corp.

Formerly chief body engineer of Hudson Motor Car Co., Detroit, **M. H. TONCRAY** has become chief engineer.

T. **H. WICKENDEN,** assistant manager, development and research department, International Nickel Co., Inc., New York City, was appointed representative of the Iron and Steel Division; and **HENRY W. LUETKEMEYER,** mechanical engineer, the Cleveland Graphite Bronze Co., is to represent the Non-Ferrous Metals Division of the SAE Standards Committee on ASTM Committee E-1, on Methods of Testing, Section on Indentation Hardness.

The Bureau of Industry Advisory Committees recently announced the formation of an Automotive Battery Industry Advisory Committee. On this committee are several SAE members: **E. T. FOOTE,** vice president, Globe-Union, Inc., Milwaukee, Wis.; **J. H. McDUFFEE,** vice president, The Electric Auto-Lite Co., Toledo, Ohio; **B. F. MORRIS,** vice president and manager, Emark Battery Division, Thomas A. Edison, Inc., Kearny, N. J.; and **ARTHUR G. PHELPS,** sales and service manager, Delco-Remy Division, General Motors Corp., Anderson, Ind.

JOSEPH A. PACKARD recently left the Available Truck Co., Chicago, where he was chief engineer, to become sales engineer at the Fuller Mfg. Co., Kalamazoo, Mich., manufacturers of transmissions.

R. T. SAWYER is now in the diesel equipment department of the American Locomotive Co., New York City, as engineer. He was formerly diesel locomotive sales engineer with the same company.

Former chief draftsman **MILTON C. EVERETT,** Briggs Mfg. Co., Detroit, has become liaison engineer at Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

ALEX L. HAYNES, formerly engineer, Airplane Division, Curtiss-Wright Corp., Buffalo, N. Y., is with the Stinson Aircraft Division of Vultee Aircraft, Inc., Wayne, Mich., as design engineer.

Robert F. Black

ROBERT F. BLACK, president of White Motor Co., Cleveland, has been elected to the board of directors of the Gabriel Co.

HARRY E. CHESEBROUGH, who had been experimental engineer with the Chrysler Corp., Highland Park, Mich., recently became resident engineer at the De Soto Motor Corp., Detroit.

Drawn by Gene Guernsey

Charles O. Guernsey

CHARLES O. GUERNSEY, vice president, J. G. Brill Co., Philadelphia, has been granted a leave of absence to serve as technical adviser to the deputy district chief of the Philadelphia Ordnance District of the Army. Active in both local and national activities of the Society, he served as SAE vice president for the Truck, Bus & Railcar Activity in 1935-36. His service on SAE committees included the Truck Division, Standards Committee, Diesel Engine Activity Committee, and the Truck, Bus & Railcar Activity Committee as well as numerous subcommittees. He was chairman of the Philadelphia Section when it was known as the Pennsylvania Section. During World War I he was a captain in the Quartermaster Corps of the Army, assigned to engineering work.

ROBERT S. MERITHEW, who has been a cooling system products engineer with the National Carbon Co., Inc., New York City, is now mechanical engineer, the Linde Air Products Co., Tonawanda, N. Y.

GORDON J. CUSHMAN, formerly assistant employment manager, Willys-Overland Motors, Inc., Toledo, Ohio, is now in the U. S. Air Corps.

HARKNESS W. CRAM, sales manager of the Aircraft Screw Products Co., Inc., Long Island City, N. Y., has been elected vice president in charge of sales.

MICHAEL LARINOFF, formerly design engineer, J. I. Case Co., Rock Island, Ill., is now test equipment designer, Continental Aviation & Engineering Corp., Detroit.

Former sales engineer **A. G. MULKEY,** Waukesha Motor Co., Seattle, has been promoted to Pacific Coast manager of the same company, and will be headquartered in Los Angeles.

S. H. LAXTON has left the Birmingham & Midland Motor Omnibus Co., Ltd., Birmingham, England, where he was chief assistant engineer, to take up an appointment as engineer and assistant to the general manager of the East Kent Road Car Co., Ltd., Canterbury, England.

HOWARD COOPER, chief lubricating engineer, Sinclair Refining Co., New York City, has been granted a leave of absence by his company to join the Marketing Division, Office of Petroleum Coordinator, Department of Interior Building, Washington.

GLENN L. MARTIN, president of Glenn L. Martin Co., Baltimore, was awarded a $1000 prize for his contribution to the war effort by the American Design Awards sponsored by Lord & Taylor. A member of SAE for 25 years, Mr. Martin was cited for the design of his 70-ton Mars for the Navy.

Formerly in the sales and engineering department of Galion Iron Works & Mfg. Co., Galion, Ohio, **C. E. PATTERSON** is now chief engineer at the Christy Park Works of the National Tube Co., McKeesport, Pa.

H. H. HOPKINS has joined Continental Motors Corp., Detroit, as field engineer. Formerly he was regional automotive engineer, Sun Oil Co., Boston.

FRANCIS LIEBER has been appointed Bell Aircraft Corp.'s sixth test pilot. Prior to this he was in the engineering department of Aero Insurance Underwriters, New York.

First Vice President **S. G. BAITS,** Hudson Motor Car Co., Detroit, has been named general manager of the U. S. Naval Ordnance Plant, being operated by the company.

SIDNEY SUMMERLEE has joined the Buffalo Arms Corp. He was formerly master mechanic, Willys-Overland Motors, Inc., Toledo, Ohio.

BYRON C. FOY, vice president of Chrysler Corp., has been elected to the board of directors of the National Dairy Products Corp.

JOSEPH LISTON, associate professor of aeronautical engineering, Purdue University, is author of a newly-published textbook entitled "Aircraft Engine Design." The aim of the book, as given in the preface, is to aid technical students in bridging the gap between the point (a) where they have a fairly complete knowledge of the fundamentals of mathematics, mechanics, and machine design, and (b) the point where they are sufficiently familiar with the application of these fundamentals to the design of aircraft engines to enable them to be of value to the aircraft-engine building industry. The publishers: McGraw-Hill Book Co., Inc.

O. H. CILLEY was elected to the board of directors of Raybestos-Manhattan, Inc., Passaic, N. J. Mr. Cilley is assistant general manager of the U. S. Asbestos Division, Raybestos-Manhattan, Inc., Manheim, Pa.

GUY W. VAUGHAN is chairman of the National Committee of the Aviation Industry to assist in raising $5,000,000 for the Navy Relief Society. The aircraft industry has been asked to contribute $500,000 to the fund, and Mr. Vaughan announces that Curtiss-Wright Corp. leads off with a contribution of $50,000. Mr. Vaughan is president and a director of the Curtiss-Wright Corp.; also president and chairman of the board of the Wright Aeronautical Corp.

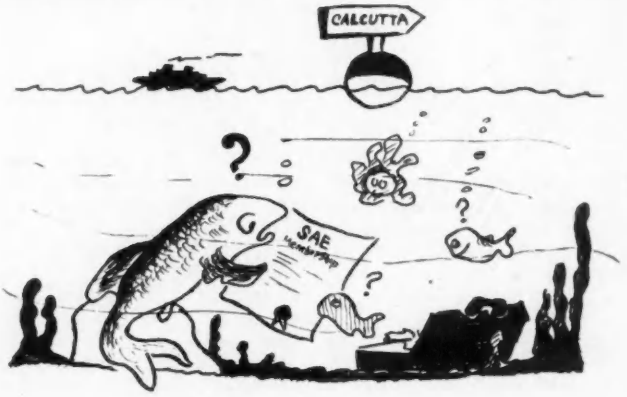
Assists Relief Society

Guy W. Vaughan

V. J. JANDASEK has become connected with the Bendix Aviation Corp., South Bend, Ind., as experimental engineer in the hydraulic division. Before joining Bendix he was experimental development engineer, K. L. Herrmann, New Carlisle, Ind.

Formerly sales supervisor of the British American Oil Co., Ltd., Galt, Ontario,

Lost Belongings, But SAE Member Is Safe



JOSHUA BAMFORD, formerly chief methods engineer, Crewe Division, Rolls-Royce, Ltd., England, has resigned to join the Indian Ordnance Service, Calcutta. On his way his ship was torpedoed and he lost all of his belongings, including his SAE membership certificate. When rescued by Americans he was wearing only his pajama pants, he reports—asking that a duplicate certificate be made out to him and held in safety in America until the war is over.

Canada, **KEITH C. ALLEN** has become special representative of the same company, Toronto.

EDWIN H. GODFREY is no longer connected with the Godfrey Mfg. Corp., New Brunswick, N. J., where he was president and chief engineer. He is now vice president in charge of engineering with Columbia Aircraft Products, Inc., Somerville, N. J.

GEORGE J. LIDDELL is now employed at the Continental Aviation & Engineering Corp., Detroit, as test engineer. He was formerly automotive engineer with the Sun Oil Co., Pittsburgh.

HENRY F. DANNEMANN, JR., has accepted a position with the U. S. Army Signal Corps Laboratory, Belmar, N. J., as mechanical engineer. Previously he had been regional engineer, Tide Water Associated Oil Co., Boston.

To further expedite training of industrial workers for jobs in Detroit's war production plants, the free training courses under the auspices of the U. S. Office of Education, offered by the College of Engineering of Wayne University, Detroit, are being materially expanded. SAE Member **E. B. NEIL,** mechanical engineer associated with Denham & Co., Detroit, is giving a course presenting advanced methods of increasing the productive capacity of plants and machines.

J. BARRAJA-FRAUENFELDER has resigned as consulting engineer of the Sun Shipbuilding & Dry Dock Co., Chester, Pa. He is now with the American Locomotive Co., New York City, working in the same capacity.

Helmuth G. Braendel
Heads Dynamometer Laboratory

HELMUTH G. BRAENDEL has left the employ of the Chrysler Corp., Highland Park, Mich., where he was experimental engineer, and is now supervisor of the tank engine dynamometer laboratory, Continental Motors Corp., Detroit.

S. P. THACHER, manager of the Tire Engineering & Service Department, U. S. Rubber Co., Detroit, Mich., has been granted a leave of absence to become special assistant to the chief of the Motor Transport Division of the Quartermaster Corps. Mr. Thacher will work in the development of a rubber conservation program for the U. S. Army.

FREDERIC R. SPEED has been appointed to the Industrial Internal Combustion, Engine Section, Construction Machinery Branch, Division of Industry Operation, WPB. He has been with the Pennsylvania Grade Crude Oil Association, Detroit office.

ALBERT C. KELLY, who had been tool designer, Air Associates, Inc., Bendix, N. J., recently joined C. L. Norden, Inc., New York City, in the same capacity.

Appointed Vice President

Robert Grant

ROBERT GRANT, who has been a manufacturing executive of the Young Radiator Co., Racine, Wis., has been appointed vice president in charge of manufacturing of the company by **FRED M. YOUNG,** president. Mr. Grant was previously with the Nash Motors Division, Nash-Kelvinator Corp., and had wide experience in management and production before joining his present company more than a year ago.

HARRY R. RICARDO'S book "The High-Speed Internal-Combustion Engine" was recently revised by H. S. Glyde, who has acted as the author's assistant for a great many years. Mr. Ricardo is chairman and technical director of Ricardo & Co., Ltd., Bridge Works, England. The book is published by Interscience Publishers, Inc., New York City.

L. P. SAUNDERS, chief engineer at the Harrison Division of General Motors Corp., Lockport, N. Y., has been appointed a member of the Subcommittee on Heat Exchangers of the Committee on Powerplants for Aircraft of the National Advisory Committee for Aeronautics.

Former service manager **GEORGE P. SALADINO,** Downtown Pontiac Corp., New York City, is now with the Curtiss Propeller Division of the Curtiss-Wright Corp., Caldwell, N. J.

J. HERVEY SHERTS, Pittsburgh Plate Glass Co., was recently transferred to Pittsburgh from the Detroit office.

Formerly sales engineer in the export department of the Sunnen Products Co., New York City, **WILLIAM J. MAURER** recently joined Baker & Co., Inc., Newark, N. J., in the production control and contact department.

ROBERT B. CRAGIN is assistant director of Refining, Office of Petroleum Coordinator, Washington.

DAVID S. BENNETCH has joined the Bethlehem Steel Co., Lebanon, Pa., as experimental engineer.

C. W. VAN RANST, chief aeronautical engineer, Ford Motor Co., Dearborn, Mich., was appointed to the SAE Aircraft-Engine Activity Committee.

FRED J. GRUMME is a civilian automotive instructor at Camp Lee, Va. Prior to this position, he had been assistant maintenance superintendent, Aero Mayflower Transit Co., Indianapolis, Ind.

★★★★★★★★★★★★★★★★★★★★★★★★

In Military Services

LT.-COL. ARTHUR B. DOMONOSKE was recently ordered to active duty for the second time. He is in the Office of the Chief of Ordnance, Washington. He had previously served in this office from August, 1940, to September, 1941, when he requested release to return to Stanford University, Calif.

GEORGE H. SCHOENBAUM has been promoted from captain to major. He is chief, fuels and lubricants unit, U. S. Army, Ordnance Department, Washington.

M. E. CLARK has been appointed a major in the Ordnance Department, U. S. Army, and has been ordered to active duty at the Aberdeen Proving Ground, Md. He was formerly sales manager, Randall Graphite Products Corp., Chicago. In World War I, Major Clark was in the Infantry, AEF.

MAJOR CHARLES A. CHOATE, Royal Canadian Engineers, has been overseas in active service for the past two years. Major Choate is now permanent president of the Trades Testing Board. In civilian life he was chief instructor, Department of Motor Mechanics, Provincial Institute of Technology & Art, Calgary, Alta., Canada.

WALTER C. PEW, general sales manager, Sun Oil Co., Philadelphia, has been given a leave of absence to serve with the Ordnance Department of the U. S. Army. He has been commissioned a major.

CAPT. FRANKLIN R. NAIL is assigned to duty with the Engineering Branch, Motor Transport Division, Office of the Quartermaster General, Washington. He was formerly engineer on special equipment, Mack Mfg. Corp., Allentown, Pa.

ROBERT S. WOLFSOHN is a first lieutenant, Air Corps, Powerplants Section, Experimental Engineering, A.A.F. Materiel Center, Wright Field, Dayton. He was formerly junior aeronautical engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va.

LEO J. KUJAWA is a first lieutenant in the U. S. Army Air Force. He is headquartered in Detroit, where he is assistant to the air service command liaison officer. Before being called to duty he was personnel director and labor relations manager of the Parker Appliance Co., Cleveland.

E. L. BROWN is a first lieutenant in the U. S. Army, Quartermaster Corps. Prior to this he was automotive engineer, the Socony-Vacuum Oil Co., New Haven, Conn.

C. M. TEMPEST is now a lieutenant, Motor Transport Maintenance Instructional Corps, Eastern Command Trades Training Center, Sydney, New South Wales, Australia. Prior to his military duty assignment, he was automotive engineering instructor, Sydney Technical College.

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NEWS OF THE SOCIETY

(*Continued from page 27*)

Simulated Bombing Attack Thrills Large Canadian Audience

■ Canadian

SPECTACULAR surprise feature of the April 17 Canadian Section Windsor meeting – which heard Joseph Geschelin speak on "The Influence of Automotive Mass Production Methods on the Manufacture of Materials of War" – was a simulated bombing attack.

Almost Too Real for Comfort

The unannounced wail of sirens was immediately followed by the blacking out of the hall, amplified radio warning of the approach of enemy bombers with fighter escort, and a few seconds later by the rolling thunder of bombardment staccato fire of AA guns and the rattle of flak. Meanwhile, brilliant flash powders of various colors illuminated the ballroom like lightning flashes. The diabolical cacaphony, fluctuating in intensity and tempo, continued for possibly ten minutes.

Making Recording Dangerous

When the lights went up, Stanley A. Ellis was introduced by Vice Chairman J. H. Hickey (in the absence of Chairman R. W. Richards). Mr. Ellis, a former Ford of Canada engineer, who has been serving Canadian Mechanical Transport headquarters near London as technical adviser and who is currently home on furlough, told the engineering audience that the sound recording which they had just heard had been made by the then-director of England of the Canadian Broadcasting Co. at considerable risk to himself in Hyde Park the night of the great incendiary blitz on "The City," the heart of London. Later, the chairman pointed out that Mr. Ellis also had been present during a considerable part of the actual recording.

Briefly describing his experiences in England, Mr. Ellis paid a glowing tribute to the fortitude and fighting spirit of the British people, especially the women.

Production Speeded

Mr. Geschelin, the Detroit technical editor, Chilton Co., guest-speaker-of-the-evening, declared that "automotive manufacturing practice has had the effect of dominating the picture of war activity."

Amplifying further this statement he said: "Even a cursory examination of the methods and equipment employed in the production of war items reveals machinery made familiar in motor-car plants throughout the country. It is safe to say that the availability of such equipment and the development of specialized techniques have been responsible in the main for the rapid expansion of defense work and for the relative ease with which the weapons have been tooled for mass production. By the same token, many of the new developments in machine-shop management resulting from the war effort will constitute the base for the advanced practice of the future. In this respect, the current activity will have its effect upon improvements in automotive practice after the emergency is out of the way."

(Mr. Geschelin has delivered this address before various other SAE Sections, the latest report having been published in the May 1942 SAE Journal, p. 45).

The annual Windsor dinner meeting was one of the largest in the annals of the Canadian Section with 355 members and guests in attendance, some coming from as far as Farnham, Quebec. Out-of-town attendants represented a dozen or more cities in Canada and the United States.

The Windsor Regional Vice Chairman, W. H. Cantelon, wielded the gavel during the general session. The host of the evening was Gotfredson, Limited. Among the headtableites were: Wallace R. Campbell, president, Ford Motor Co. of Canada, Ltd.; John D. Mansfield, president, Chrysler Corp. of Canada, Ltd.; and Alex M. Miller, regional oil controller.

Tore Franzen, chairman of the Detroit Section, briefly addressed the meeting.

Stresses Rear Axle Lubrication At Fuels and Lubricants Session

■ Chicago

THE diameter of rear axles is constantly decreasing in spite of the increasing torque and speed. In contrast to ring gears of 14 in. diameter of a few years ago, we have present ring gears measuring 9⅜ in. in diameter. Yet there is today less field trouble, for which much credit goes to compounded lubricants.

This was one of the interesting and informative trends in gear design and lubricants as analyzed by J. O. Almen, head of the Mechanical Engineering Department No.

Almen Tells Chicago Section About Gear Lubricants

Speakers' Table: (left to right) Col. Montague, U. S. Marine Corps; Leonard B. Gilbert, section chairman; J. Howard Pile, technical chairman; J. O. Almen, speaker; H. L. Moir, Pure Oil Co., who introduced Mr. Almen

Photos, courtesy Robert J. Temple & Associates

(Below left) William S. James, chief engineer, Studebaker Corp. (third from left) with table of members and guests

(Below right) James T. Greenlee, chairman, Program and Meetings Committee, (fourth from left) with table of members and guests

L. General Motors Research Laboratories Division, before 143 members and guests at Chicago Section's April 7 meeting, a Fuels and Lubricants Activity session directed by Joseph A. Moller, Pure Oil Co.

The downward dimensional trend in rear axles, Researcher Almen declared, will probably continue until an economic balance is attained between the decreasing cost of the gears and the increasing cost of the bearings. With the decreasing gear size will come higher tooth loads and possibly increased temperatures which will have to be met by improved lubricants, and by designing the gears to reduce, wherever possible, the factors that are responsible for scoring, he said.

Gear Scoring Illustrated

By means of screen slides, the speaker illustrated typical gear scoring under a variety of heat generating and tooth curvature conditions. In highly-loaded gears, he said, the unit pressures may be 350,000 psi to 400,000 psi, and since these pressures occur while the teeth are sliding upon one another at high velocity, it is not so difficult to accept the welding theory of scoring.

Among the conclusions illustrated by Mr. Almen's diagrams, several may be cited. Compressive stress between gear teeth can be reduced if radii of curvature of the teeth are increased. The use of finer-pitch, shorter teeth is the most effective way to reduce the sliding velocity, since the shorter the teeth, the less the sliding.

Gear-tooth proportions should consider strength of the teeth as well as the compressive stress and the sliding velocity, Mr. Almen declared. In spiral bevel and hypoid rear axles, in contrast to spur and helical gears, it is necessary, he said, to use coarse-pitch teeth to avoid dangerous bending stresses. With these coarser pitches come increased compressive stress and greater sliding velocities, Mr. Almen declared.

Difficulty of Lubricating Hypoids

Increasing sliding velocity of the hypoid over the spiral bevel pinion, due to the offset pinion, accounts for the greater difficulty in lubricating a hypoid axle than in lubricating a spiral bevel axle, Speaker Almen pointed out.

Study of the driving force of gears, the unit pressure on the contact area of the mating gear teeth, and the anti-welding characteristics of lubricants, the speaker declared, help to point the way to reduction of the burden for the lubricant, or alternatively, to permit the use of smaller, lighter, and cheaper gears.

A dynamometer full-scale axle test, Mr. Almen emphasized, becomes a reasonably accurate measure of scoring, but not necessarily a reliable device for measuring other lubricant characteristics. Actual service experience, he stressed, is basically the only source of reliable information for the designer of lubricants and for the designer of gears.

Following the talk, questions as to gear temperature and viscosity of oils in hypoid gear conditions, described by the speaker, were raised among others, by: William S. James, chief engineer, Studebaker Corp.; William H. Oldacre, president, D. A. Stuart Oil Co., Ltd.; and Howard J. Pile, editorial director, Chek-Chart Corp., and technical chairman of the meeting. Speaker Almen was introduced by Harry L. Moir, research engineer, Pure Oil Co. Leonard B. Gilbert, section chairman, presided.

Non-Ferrous Standards Group Pushes Emergency Specs

RAPID development and issuance of recommended SAE "emergency" non-ferrous metal specifications was emphasized by Chairman W. H. Graves as the No. 1 job of the Non-Ferrous Metals Division of the SAE Standards Committee and its three permanent subdivisions at its meeting in Detroit, on April 22. These emergency specifications are being developed to conserve a maximum amount of tin, copper, and other scarce metals, in cooperation with the general materials conservation program of the War Production Board and U. S. military services. They are recommended for use in place of the regular SAE Standard specifications wherever possible. These temporary specifications will be coordinated in so far as possible with the alternate emergency specifications set up by the ASTM.

Emergency Specs May Be Permanent

Although designated as "temporary" specifications, the belief was expressed, at the April 22 meeting of the Non-Ferrous Division, that many of the emergency compositions, including the silicon-bronzes, will have opportunity to prove their worth during the emergency and therefore may come into permanent use.

The second assignment accepted by the Division is the modernization of all SAE non-ferrous metal specifications to conform to latest engineering practice, likewise coordinating, in so far as possible, the revised specifications with ASTM specifications.

P. V. Faragher is chairman of the Subdivision A – Light Alloys; L. P. Saunders is chairman of Subdivision B – Copper Alloys; and Subdivision C – Miscellaneous Alloys, concentrating on solders and white bearing metals, is chairmanned by W. E. Day, Jr.

WPB Official Stresses Urgency

Carter S. Cole, Specifications Branch, Bureau of Industrial Conservation, WPB, was the guest of the Non-Ferrous Metals Division at its April 22 meeting. In a statement issued following the Division's meeting, Mr. Cole emphasized the urgency of this conservation work. Excerpts from Mr. Cole's statement follow:

"Our job today is very definitely to make what we have do the most effective work that it can to further our war effort. Combat material comes first—everything else is secondary. Even in the combat material there is no reason for using material that is better than it needs to be. Indeed, we might add an Eleventh Commandment: Thou shalt not use scarce or strategic material when thou dost not need to do so.

"The material that will actually be used in any given instance is the designer's responsibility. The specification writer can only give him the tools with which he works. Those that have heretofore been available have not always been truly adequate for all phases of conservation. To deal with this problem there has been just completed a careful review of the copper-base alloy castings field by ASTM, The Federal Specifications Committee, and the SAE. This work was initiated at the request of the Specifications Branch of the Bureau of Industrial Conservation of the War Production Board.

"Emergency alternates have been set up with two primary objectives in view – first, to cut down the tin content, and second, to permit the greater use of secondary material. The SAE at a special meeting of its Non-Ferrous Metals Division in Detroit on April 22 proposed adoption of emergency alternate specifications for the tin bronzes.

Sample Substitutions

"An illustration as to how the designer can make use of these emergency alternates can be taken directly from the emergency alternate of the Federal QQ-B-691a specification. This calls attention to four types of substitutions that may be made:

"1. Substitutions that conserve tin – a change to straight copper-zinc, or to a copper-silicon alloy.

"2. Substitutions that conserve both tin and copper – changing to yellow or Naval brass instead of a tin bronze.

"3. Substitutions that conserve all non-ferrous elements – changing to gray cast iron, malleable iron, or cast steel, where this is possible.

"4. When a tin bronze is absolutely necessary for the purpose in hand, to use the alloy with the lowest possible copper and tin content and to pick an emergency alternate grade that permits the use of secondary metal whenever it is possible to do so.

"These are the same thoughts that should be borne in mind by any designing engineer when he examines the emergency alternate specifications to see what substitutions he can make that will result in true conservation. The new tools that he has been given for this purpose tabulate the recommended substitutions and compare the compositions of the standard alloys and the emergency alternates." (These tables are published on p 34. "Impact of War on Industry Section," this issue.)

Discourages Wild Ideas For Tire Substitution

■ *Pittsburgh*

AT the seventh and final meeting of the Pittsburgh Section for this year, held April 28, Dr. Jules Labarthe of Mellon Institute, cautioned engineers about believing wild ideas concerning automobile tire substitutes. We have read of wooden tires, tires of hardened paper, nitrogen-filled inner tubes, cork inner tubes, he said, and these are only a few of the "crackpot" substitutes being suggested. We may have to use some substitute for rubber, but it would seem more sensible to conserve the tires we have to the fullest extent, he said.

Our synthetic rubber program is promising, Dr. Labarthe noted, but we must realize that the planned production at the rate of 700,000 tons per year by the end of 1943 is just what it says – a rate. An accomplished production of that tonnage will not be realized until the end of 1944, he predicted.

Dr. Labarthe also discussed dyes, wool, garments, bleach, foods, appliances, plastics, and similar items, as affected by the war.

Condensed

Sea Sledding TO VICTORY

Robert M. Curtis, MIT Student, Outlines The Possibilities of Using Sea Sleds in War

■ ***New England***

(*See also p.* 45)

IT was the last month of World War I, and the United States Navy was putting Capt. Mustin's Sea Sled through the paces. Out of the haze at Hampton Roads roared a 55 ft boat at 60 mph; it was riding level and softly, and on its back rode a Caproni airplane bomber that suddenly left the carrier and took to the air. It was incredible; here was the fastest, heavyweight-carrying boat the Navy had ever seen.

Torpedo Boats Roughriding

This story is now history, but it makes one stop and think of the possibilities of the Sea Sled in World War II. From all parts of the world we read of small, fast torpedo boats that make daring attacks against enemy navies, yet there is something missing in the reports – something between the lines about disastrously roughriding, reduced speeds, and imperfect aim due to an unsteady platform. It is here that the Sea Sled inventor steps in and shows his aces.

Murray & Tregurtha Co., Sea Sled builders, put their 38½ ft model No. 186 to test under the eyes of Com. Roome of the Royal Canadian Navy following its completion in 1941. (This particular boat is powered with two Murray & Tregurtha K-6 engines of 325 hp each at 1650 rpm.) In Com. Roome's official report on the trials of Sea Sled No. 186 to the Chief of the Naval Staff at Ottawa, the following list of advantages was given:

1. Greater speed per horsepower
2. Greater maneuverability
3. Superior sea-keeping qualities and speed in heavy weather (not proved on trials, but accepted from Murray & Tregurtha Co. records from letters on file)
4. Superior weight-carrying capacity
5. Steadier gun platform
6. Clearer vision at high speeds – wash and high spray confined to 10 deg either side of fore and aft line directly astern, giving clear vision 340 deg.

Crouch's Logarithmic Chart of speed versus pounds per horsepower compiled from data on boats gives a comparison between round bottom, V-bottom, stepped hydroplane, and Sea Sled boats. If one value of pounds per horsepower is chosen, say 30, the V-bottom is found to be about 5 mph faster than the round bottom, stepped hydroplanes 6 mph faster than the V-bottom, and two-screw Sea Sleds about 3 mph faster than stepped hydroplanes – the latter corresponding roughly to the best possible performance obtained with V-bottom PT boats. The four-screw Sea Sleds are an additional 9 or 10 mph higher than the two-screw Sleds; their performance can be stated as decidedly superior.

Design Innovations

There must be some good reason for such performance; the answer can best be ascribed to two innovations – the inverted-V bottom and surface propellers, the same novel features that were incorporated in the torpedo-carrying Sea Sled design which Albert Hickman took to Washington back in 1914.

The Sea Sled bow is concave when viewed from the front, and air is thus forced under the boat, creating an air cushion. The sled rides this air cushion and is pushed up and out of the water along its entire length, thus producing a level-riding boat with no decided planing point. Because the air cushion under the bow is large, there is no tendency for the bow to slap down hard against the water; its motion is somewhat analogous to slamming the door of a small closet – the air forms a nice damper. In addition to this fore and aft stability is the lateral stability offered by the two wetted surfaces separated by almost the full beam of the boat. It is this latter feature that prevents broaching in heavy seas. Because the Sea Sled bow is inverted, the turning moment is the reverse of the conventional bow, and there is actually a tendency for the sled to head with the following seas instead of broaching.

Unique Surface Propellers

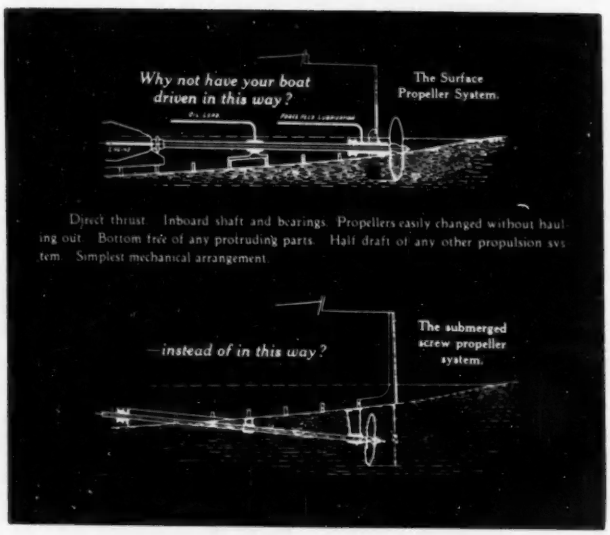
To the uninitiated, the surface propeller is perhaps the most radical part of Hickman's design. As the props are more than half out of water, there is a form of cavitation present. This is not to be confused with the total cavitation that sometimes makes underwater props spin inefficiently, but does mean that the after face of the blade is doing most of the work, particularly none being done by the "drawing" effect of the blade. The design of the propellers must be such as to allow very little slip – then all the horsepower output is absorbed by the props in pushing against the water. It has been found that an underwater prop used as surface prop drops 2 or 3% in efficiency, but that the appendage resistance of the shaft, struts, and hub amounts to over 20%. In addition to this, there is considerable advantage in low draft and the unlimited size of the propellers used by Sea Sleds.

Said Crouch to Hickman

In 1939, George F. Crouch won the Navy's competitive prize for the best V-bottom high-speed torpedo boat design, and on the very next day wrote Mr. Hickman as follows:

"For more than 30 years I have been in intimate contact with the developments of high-speed motor boats of all sizes and types and know by experience how Sea Sleds perform. . . . I believe that the performance of a Sea Sled, such as Mr. Hickman has outlined, will be far superior for high-speed torpedo carrying in either rough or smooth water to that of the best possible V-bottom or high chine design."

With this endorsement, it looks as though Mr. Hickman and Sea Sleds, Inc., Mr. Murray, and Murray & Tregurtha have a real weapon with which to defend our shores and protect our ideals – to them we say "Good Luck."


Why not have your boat driven in this way?
The Surface Propeller System.
Direct thrust. Inboard shaft and bearings. Propellers easily changed without hauling out. Bottom free of any protruding parts. Half draft of any other propulsion system. Simplest mechanical arrangement.
—instead of in this way?
The submerged screw propeller system.

■

Some advantages of surface propellers: good acceleration plus speeds of 1700 to 1800 rpm; no slip at leading edge; 15% and less slip at trailing edge; rpm constant in rough water; good towing ability; cannot foul on weeds; accessible from a row boat; vibration is low; engine can be near rear; and boat may be maneuvered excellently due to side thrusts from the underwater parts of props

SAE Aeronautical Standardization Program Proceeding at Rapid Pace

COMPONENT parts for all aircraft engines, propellers, and other accessories, and chemical compositions for materials for the nation's fighting forces are being rapidly standardized by the Aeronautics Division of the SAE Standards Committee, to speed aircraft production.

To date 53 Aeronautical Standards (AS) and a total of 221 Aeronautical Material Specifications (AMS) have been approved by the Division. This program started only 16 months ago, and this achievement is the result of intensive work by scores of committees manned by more than 185 engineers of the entire aeronautical industry.

On June 1 a group of important new and revised Aeronautical Material Specifications will be issued to aircraft engine, airframes, propeller and other accessory manufacturers and material suppliers. Close coordination with officers and civilian engineers of the Army and Navy has been kept at each stage of these developments. The group of new and revised Aeronautical Material Specifications includes:

- Six felt specifications (AMS 3285, 3286, 3287, 3288, 3290 and 3291).
- Seventeen stainless-steel specifications (AMS 5510B, 5515A, 5516A, 5517A, 5518A, 5519A, 5570B, 5575A, 5610A, 5615A, 5630A, 5632, 5640A, 5641, 5645B, 5685A, 5690A). These specifications cover chemical compositions and properties of sheets, strip, bars and forgings. This work has required numerous conferences between the metallurgists of the steel producers and the users to reach agreements in the interest of simplifying the problem of the material suppliers. The whole project was steered toward eliminating as much critical material as possible in the various alloys, and toward reducing the number of commercial specifications to utilize best the production capacity of the steel suppliers. Furthermore, these revisions have been based on the recommendations of the WPB Technical Advisory Committee for Aeronautical Steels.
- Nine chrome-molybdenum seamless-steel tubing specifications (AMS 6360A, 6361, 6362, 6363, 6365, 6366, 6367, 6368, and 6369). These specifications cover two different carbon ranges (0.27-0.22 and 0.32-0.39) as well as heat-treatments up to 200,000 psi, the range of heat-treated steel tubing required to build bombers, fighters, and trainers.
- Three new aluminum specifications for permanent-mold aluminum-alloy castings (AMS 4280, 4282 and 4284).
- Three welded-steel tubing specifications (AMS 5053, 5077, and 6510). One of these (AMS 6510) is for chrome-molybdenum, and the others cover the low-carbon alloy steel range (0.15 max, and 0.22-0.28).

Steels Available for Test

As a result of the work on these aircraft steel specifications, standard compositions will become immediately available to manufacturers from steel mills and suppliers, and may be purchased by the entire industry through the use of these standard procurement specifications and thereby facilitate their being manufactured into aircraft for our fighting forces.

Following up the recommendations on alternate steels by the WPB Technical Advisory Committee for Aeronautical Steels, a group of 16 tentative Aeronautical Material Specifications for the proposed alternate steels to be investigated by aircraft industry, have also been prepared and released to the committee members and other interested parties throughout the industry. The compositions of the proposed alternate steels covered by these specifications have been brought in line with the National Emergency Steel Specifications of WPB with respect to nickel, chromium, and molybdenum content. Their composition is based upon the best possible use of scrap nickel, chromium and molybdenum – an important factor considering the large amount of material removed in manufacturing aircraft-engine parts, for example.

Caution Will Mark Changes

It should be noted that neither the military forces nor the aircraft, engine, and accessory manufacturers will authorize or make any substitution of such steels *until* satisfactory experience has been developed to insure the required safety in flight. Aircraft engines and component parts are today designed to obtain the maximum performances of many materials in order to achieve the required maximum horsepower-to-weight ratio. Changes must only be made cautiously in the interest of preventing failures in flight.

The task of developing these material specifications has borne heavily upon the Aircraft Materials and Processes Coordinating subdivision, of which J. B. Johnson, Materiel Center, U. S. Army Air Forces, is the chairman. Serving with Mr. Johnson are L. D. Bonham, Lockheed Aircraft Corp.; B. Clements, Wright Aeronautical Corp.; and N. E. Woldman, Eclipse Aviation Division, Bendix Aviation Corp., chairmen of the Airframes, Aircraft-Engine and Accessory Committees of the Subdivision respectively. A total of 34 government and industry materials experts serve on these three committees handling materials for aircraft engines, airframes, propellers and other aircraft accessories.

More Aero Standards

On April 15, six additional Aeronautical Standards and Aeronautical Recommended Practices, developed by the Aircraft-Engine Subdivision, headed by Val Cronstedt, Pratt & Whitney Aircraft, were issued following their approval by the Aeronautics Division. This brings the total of Aeronautical Standards (AS) to 53. The new standards are:

- Aircraft Ignition Shielding (AS 29) which was developed by Committee E-4, headed by A. L. Beall, Wright Aeronautical Corp. So rapid has been the development of aircraft engines that the task of simplifying design has been tremendous. This standard includes dimensions of standard engine connections, as well as performance requirements and test methods. After numerous conferences, manufacturers of engines and ignition shielding equipment finally agreed to this standard for use in protecting radio beams from ignition interference, which is of vital importance for airline as well as for combat aircraft operation. Serving with Mr. Beall are A. T. Gregory, Ranger Aircraft Engines; D. W. Randolph, Packard Motor Car Co.; F. K. Von Mertens, Pratt & Whitney Aircraft, and B. Clements, Wright Aeronautical Corp.
- Aircraft Involute Spline standard (AS 84) for the first time establishes standard characteristics for the 30-deg pressure-angle type, widely used in the aircraft-engine and aircraft-accessory fields where highly stressed parts are necessary in order to save every possible ounce of weight. The standard calls for a full radius at the root of the teeth to decrease stress concentrations at these points to a minimum.
- Aircraft Carburetor Envelopes (ARP 57, 58, 59, and 60). These "envelope" drawings will control overall dimensions for the 48-, 58-, 78-, and 100-in. sizes of the carburetors of the future. Committee E-1, under the chairmanship of F. J. Wiegand, Wright Aeronautical Corp., has brought together the best engine and carburetor engineering opinion and experience in the country to determine the maximum allowable dimensions of these carburetors for use on huge aircraft engines now being developed. At present there are *Aeronautical Recommended Practices* (ARP) and, when sufficient experience has been gained with their use in service, they will be recommended, with whatever revisions are necessary, for approval as Aeronautical Standards. Serving with Mr. Wiegand in this project, which has required numerous committee meetings and intensive engineering studies by the engine and the carburetor manufacturers, are M. E. Chandler, Chandler-Evans Corp.; M. J. Kittler, Holley Carburetor Co.; R. C. Palmer, Pratt & Whitney Aircraft; H. G. Tarter, Bendix-Stromberg Division, Bendix Aviation Corp.; and M. A. Trisler, Allison Division, General Motors Corp.

Recommendations for standard sizes and gages of 61-S aluminum-alloy tubing for use in engine and accessory parts are also in process of development. This amounts to a large tonnage of aluminum tubing, and the suppliers and parts manufacturers alike have heretofore been beset with a wide range of sizes and gages. This work is an example of important simplification by the industry in the interest of reducing manufacturing costs. The Aeronautical Board of the Army and Navy is issuing standards on the 24-ST, 2-S½H, and the 52-SO types of alloys. Present designs will be converted as rapidly as possible to the new chemical compositions and the standard sizes, which will be extensively used in new designs throughout the aircraft industry. Surveys of aircraft engine, propeller and accessory manufacturers made by the SAE, studies developed by the National Aircraft Standards Committee, and reports of suppliers were correlated and used by the Aeronautical Board for the basis of this work.

The foregoing summary covers only a small portion of the work underway and completed by the entire group of 43 committees and 189 engineers participating in the entire program aimed at immediate increased production of aircraft and aircraft engines, propellers and accessories.

(Watch the SAE Journal for future progress reports on aeronautical and material standards and specifications.)

Compares Pre-War and Present Aircraft Plant Procedures

■ *Detroit*

A COMPARISON of pre-war aircraft plant procedures and today's automotive methods was given to Detroit Section members at their May 11 meeting by Don R. Berlin, aeronautical engineer, General Motors Corp. Mr. Berlin, noted as designer of the Curtiss P-36 and P-40 series of pursuit planes, spoke on "Designing Aircraft for War Production" at the Horace H. Rackham Memorial building which now houses the Detroit Section offices. More than 900 engineers heard the talk.

Mr. Berlin, introduced by R. C. Gazley, aeronautics activity vice chairman of the Section, recalled that the first all-metal, stressed-skin design airplane was submitted for government approval only 13 years ago, while Mr. Gazley was with the Department of Commerce. He also contrasted modern fighter planes with those of 20 years ago, saying that today's models are three times as fast, three times as powerful, three times as heavy, and offer only one-third as much wind resistance as the earlier ones. Top speed has been steadily increased, he pointed out, so the average rate of increase approximates one mph per month, through the 20-year period.

He explained that incomplete and sketchy drawings, tool modifications which the shop did not transmit to the engineering departments, and other bases for confusion existed in pre-war airplane plants simply because volume of production was so low that necessary engineering funds were not available to correct these conditions. Every effort is made under present-day conditions to insure that drawings are complete, and are checked accurately, he said.

In detail design, after the technical aeronautical considerations are fully met, airplanes are "just like anything else," Mr. Berlin stated, adding:

"Here is where the aeronautical engineers can use the automobile engineers' experience. We haven't kept too-well up-to-date, or followed detail closely enough, ourselves. . . . Later on the auto industry will be the one to gain, for instance with experience gained in the lighter alloys of the airplane world."

Mr. Berlin, somewhat of a newcomer to the Detroit scene, declared that "it is surprising how stuff in Detroit is rolling" and predicted confidently that "in a few months the rate will be such that there will be no comparison as far as the Axis is concerned." Concluding, he predicted that American and Allied air power soon would take the battle to the enemy.

Also appearing on the same program was the Very Rev. Charles Cloud, S.J., president of the University of Detroit. He declared that the profession of engineering required "interests beyond the profession; the precept, 'never let a day pass without reading, studying, thinking', and the knowledge that no man is big enough to be independent of his fellows." Father Cloud said that a social soundness, solidity, and depth is needed to make a success of the engineering profession.

Surprise guest at the speakers' table prior to the meeting was Charles A. Lindbergh, of Ford Motor Co., making his first public appearance since starting to work for the Ford company recently.

U. S. ARMY WANTS GRADUATE MECHANICAL ENGINEERS

GRADUATE mechanical engineers, who are *not at present engaged in an essential war industry*, and who are interested in being considered for *a commission in the U. S. Army* should communicate *at once* with The Division of Military Personnel, Office of the Chief of Ordnance, Washington, D. C.

Due to the urgent necessity of expanding the armed forces of our nation, the Ordnance Department of the Army is in need of such men who have *a record of successful experience in the automotive field.*

Application forms and additional information can be obtained from the above mentioned office.

SAE-WEB Subcommittee Reports Slashes in War-Vehicle Tin Usage

WITH only about one-third of the tin representing American peacetime requirements now available for Allied use, the Lead and Tin Subcommittee of the SAE War Engineering Board has been working intensively to develop ways and means to cut to the bone the amount of tin used in military and essential civilian automotive vehicles. At recent meetings of the Subcommittee, sponsored by D. G. Roos of the SAE-WEB, the following progress was reported:

Radiator Solder

Various companies report reduction of the tin content in solders used, in all cases down as far as 30%, in some cases down to 15%. One concern in going from 40% to 15% has made a saving of 1.34 lb of tin per radiator.

Several companies report satisfactory results from the use of a "high-lead silver solder" containing 99% lead, 1% silver and no tin throughout the construction of sample radiators. According to this and other experience, this solder has been found to be preferable to high-lead silver solders of higher silver content. As a result, to date, the Subcommittee recommends that the silver content of these solders should not be greater than 1¼%.

However, it was the consensus of the Subcommittee that the presence of *some* tin would materially assist in getting better contacts between tubes and fins or between water courses and spacers, especially if used on steel or combination copper-and-steel radiators. It was felt that by permitting the use of a small amount of tin a greater saving would actually result because it would result in a more rapid adoption of high-lead silver solders. Limitations reported for the high-lead silver solder without any tin are that it must be used at a considerably higher temperature than conventional lead-tin solders, 600 F and upwards, depending upon the application, and that it does not wet steel very readily, an electroplated layer of lead or copper on the steel being necessary to get good and quick adhesion.

As a result, the Subcommittee has recommended with WEB approval that careful consideration be given to the use of high-lead silver solder for radiator use, and that users of radiators request their suppliers to submit samples of radiators fabricated by the use of high-lead silver solder. Universal adoption of this solder would practically eliminate the 10 to 40% tin formerly used in automotive radiator solders.

In anticipation of a change from copper to combination copper-and-steel or steel radiators, it also has been recommended that the use of terne coating for corrosion protection be replaced by lead plating.

Photo by The Detroit Free Press

Surprise guest at the speakers' table of the Detroit May 11 meeting was Charles A. Lindbergh making his first public appearance since starting to work for the Ford Motor Co. With him are: (left) A. J. Fisher, General Motors Corp., and (right) Clarence W. Avery, Murray Corp. of America

Conserving Tin in Body Solder

As much as 9 lb of body solder, containing up to 30% tin, have been used per body in some Army trucks. Part of this solder is functional, used for joining parts and for filling leaks in seams. In this case, the SAE War Engineering Board has approved the Subcommittee's recommendation that the tin content be reduced to a maximum of 15%.

Much of this solder, however, is nonfunctional, and here the recommendation is that such solder be eliminated. Before such elimination can be accomplished, however, certain requirements on smoothing of seams specified by the government agencies ordering these vehicles must be waived.

A survey of manufacturers shows that many of them do not use solder in their truck cabs. Many other firms are making rapid progress in the complete elimination of body solder. In ordinary Army truck cabs the residual solder is of the order of 0.1 to 0.2 lb. The reconnaissance car made by one firm uses 0.187 lb of 30-70 solder, containing 0.06 lb of tin. The highest tin percentage in any of this solder is 30%. One company is already using 15-85 solder. Large additional savings are predicted by the committee before its next meeting.

Reducing Tin in Bearings

Experiments are being conducted on bearing babbitt with a tin content lower than the maximums established by the War Production Board.* As a further means of tin conservation in steel-backed bearings, the substitution of copper plate for tin plate on the steel backs is recommended.

Bronze Bushings

Bronze bushings (containing from 4 to 10% tin) of both the solid and the split type are being replaced by steel-backed bushings bonded to a relatively thin layer of bronze. Sintered bronze bushings are being replaced by bushings of ferrous-base sintered powdered metal powder where possible. For differential gear and differential side gear bushings, stamped steel with a phosphate coating is being used successfully to replace bronze.

Gasoline Tanks

One company is going into production on a gasoline tank from which a considerable amount of lead-tin solder has been eliminated by the use of high-lead silver solder and silver brazing, the latter being used to fabricate a tube assembly which is later installed in the tank. The completely assembled tank will be treated with an insoluble-phosphate coating inside and out to provide a base for exterior paint, improve interior corrosion resistance, and neutralize possible traces of soldering flux. This gasoline tank was approved for production after satisfactory road tests of six-months' duration. As a result of this experience, it has been recommended that all vehicle makers investigate the possibility of substituting high-lead silver solder for lead-tin solder in gasoline tanks.

Miscellaneous Parts

Investigations of various other means of conserving tin on many parts of military vehicles are being conducted by their makers.

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* *For news of recent government restrictions on tin for automotive use, see "Tin is Today's Cinderella Metal," p. 31, this issue.*

Southern California

Mass Production of Large-Size Aircraft Templates Speeded by Advanced Electrolytic Etching Process

Northrop Engineer Reveals How Technique Gives Exact Duplication, Eliminates Hand Cutting and Skilled Labor

R. R. Nolan, superintendent of production engineering, Northrop Aircraft, Inc., read a paper entitled "Electrolytic Etching in Aircraft Tooling" (see below) at the April 10 meeting of the Southern California Section. At the same meeting A. W. Davies, superintendent of tooling, Douglas Aircraft Co., Inc., spoke on "Aircraft Master Tooling." Unfortunately, Mr. Davies' paper is not available for review. NOTE: 25 Douglas engineers chartered a transport plane to attend the meeting.

BY applying the ancient art of etching to production of modern 4 x 6 aircraft templates, Northrop engineers are breaking serious man-hour bottlenecks.

Through adaptation of electrolytic etching to template duplication, Mr. Nolan feels Northrop has perfected a process which fulfills the requirements of an ideal template duplicating system.

Eminently Successful

As proof of its success, he reports the following:

1. *Exactness of scale* – Templates can be produced accurate to within five thousandths of an inch in contour and absolutely accurate with respect to surface lines.

2. *A durable image* – The etched image is far more durable even than the original template because lines and markings can be sunk to a greater depth than can be accomplished by hand scribes and stamping dies.

3. *Elimination of hand cutting* – The templates are etched completely leaving only a slight burr which is readily removed with file or sander. The time in the etching machine consumes no man-hours. Block templates are no longer cut and filed in the usual laborious method, but rather, the block template line is scribed on the original layout template.

4. *The elimination of highly skilled labor* – The process can be taught to anyone of average mechanical ability in at most 30 days.

5. *Low initial equipment cost* – A very fine duplicating laboratory can be set up to handle 4 x 6 plate for a cost not exceeding $10,000.

6. *Low operating costs* – On a basis of group duplication using 4 x 6 sheet, templates can be produced at a cost of less than 20¢ per sq ft, including chemicals, negative material, and labor.

Modus Operandi

The etching process involves the use of a transparent negative which is not secured photographically, but rather by a contact printing method. The template or group of templates to be duplicated are placed on a bed of a specially-designed press which

Author
R. R. Nolan

resembles, in principle, a cylinder printing press. The face of the template is inked by means of a composition roller; the ink is a special type which has excellent laying qualities and maximum opacity.

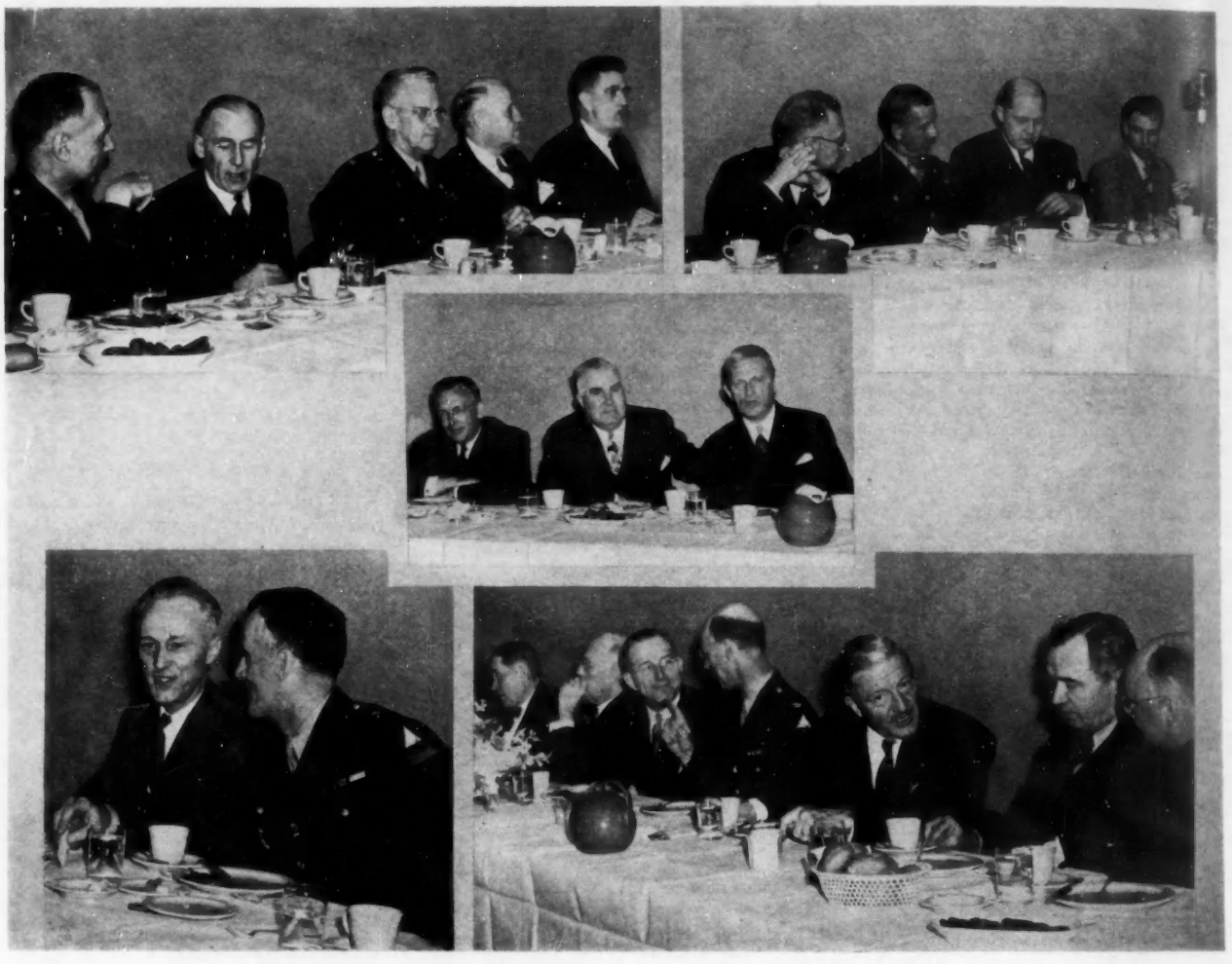
A sheet of thin-grained acetate is placed over the template and a total pressure of approximately 1000 lb is applied by passing a steel roller over it. Due to the fact that the ink does not fill the scribe lines or stamp depressions on the template, these areas are clear on the resulting impression on the acetate sheet. It is dusted with finely-ground lamp black to insure instantaneous drying of the ink image and to increase its opacity. Thus, the acetate sheet becomes a negative.

The Duplicate Templates

Duplicate templates are made from auto body steel. After the steel has been degreased, thoroughly cleaned, and then washed with cold tap water, a sensitizing agent is applied in a centrifugal whirler. The sensitizer (the same as used for making printing plates for the lithograph press) is poured slowly into the center of the sheet and the whirling action spreads it evenly over the sheet surface.

Taken from the whirler and dried, the plate is placed face up on the table of a vacuum printing frame. The negative is then placed on top of the sensitized plate face down, and the vacuum is applied. (The

Distinguished Speakers' Table Welcomes Gen. Devers at Detroit Section



(Top left) Col. R. Z. Crane; E. W. Winans, chief engineer, Federal Motor Truck Co.; Lt.-Col. E. H. Besse; E. W. Seaholm, chief engineer, General Motors Cadillac Motor Car Division; and L. R. Buckendale, vice president in charge of engineering, The Timken-Detroit Axle Co.

(Top right) W. J. Davidson, General Motors Corp.; Major-Gen. J. L. Devers (guest speaker); Tore Franzen, Detroit Section Chairman; and Dr. Earl H. Pritchard, Wayne University

(Center) C. L. McCuen, vice president in charge of engineering, General Motors Corp.; Fred M. Zeder, vice chairman of the Board, Chrysler Corp.; and C. E. Sorensen, Ford Motor Co.

(Bottom left) R. J. Waterbury, body engineer, General Motors Corp.; and Brig.-Gen. Brooks

(Bottom right) D. A. Wallace, president, Chrysler Sales Division; M. E. Coyle, general manager, General Motors Chevrolet Motor Division; Harvey Merker, president, Engineering Society of Detroit; Col. Devore; Col. Rockwell; D. G. Roos, chief engineer, Willys-Overland Motors, Inc.; and L. S. Sheldrick, engineer, Ford Motor Co.

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Major-Gen. J. L. Devers' paper "Field Maintenance of Tanks" which was featured at the April 20 Detroit meeting is printed in full (pp. 15-19)

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vacuum assures absolute contact between the negative and surface of the plate.)

The plate is then exposed for about two minutes, through the negative, to a brilliant light (white flame carbon arc or a certain type of fluorescent). The light passing through only the open portions of the negative, hardens the corresponding portions of the sensitized plate.

After it is removed from the printing frame, developer is applied to the plate. The developer contains an agent which dissolves all the unexposed colloid leaving the original metal and the exposed image. Upon complete development – about two or three minutes – the plate is flushed with at least two applications of anhydrous alcohol to stop developing action, and remove the grease film. It is inked, then, in the same manner as the original templates, but this time, with an etching ink. The plate is then washed in cold tap water, and the colloid image, which was hardened by light exposure, washes away leaving the exact duplicate image of the original template. . . . You now have a plate whose background is completely covered with a film of etching ink, leaving as bare metal only the scribed lines and stamping of the original template.

"Dragon's blood" is then applied to the plate. This reddish powder, (essentially asphaltum) adheres only to inked portions. The back of the plate is brushed or sprayed with an etch resist coating of shellac asphaltum, or plastic. The plate is then baked in an electric oven at 500 F for 10 min until the ink and "dragon's blood" are fused together to withstand the action of the electrolyte.

The plate is placed in an etching machine that resembles the ordinary electro-plating tank. (It differs in process, however, in that the work becomes the anode or positive pole. Lead sheet serves most satisfactorily as the cathode since it is unaffected by the electrolyte – a concentrated solution of sodium chloride (or common table salt). After approximately five minutes the plate is removed from the tank when the lines and stamping have been etched to about five thousandths of an inch. These lines and stampings are then stopped off by asphaltum varnish. The plate is returned to the etch tank for approximately forty minutes for the outline or external contour of the template to be cut out. If the plate is removed at the right time it will be found that the various templates are entirely etched or cut through and are held together only by the tough varnish applied to the back of the plate.

High-Altitude Bolivian Railcars Get U. S. Car Engines in Redesign

▪ New England

ONE of the world's "last stands" of wood-burning locomotives has capitulated to American automotive power, New England Section members were told April 16 when Daniel F. and Fred F. Flowers, MIT students, reported on "High-Altitude Railcars in Bolivia."

Novel Bolivian Autocarril

The Flowers brothers, having recently completed a many-months stay in Bolivia, gave a graphic description of the autocarril – "automobile on rails" – the Bolivian answer to the problem of carrying passenger traffic over the torturous Andes.

On a typical state-owned run from Potosi, a mining center, to Sucre, the old capital of Bolivia, railway equipment must climb ruling grades of 3%, operate at elevations of 8000 to 13,000 ft, and maneuver curves as sharp as 200 ft radius. About 15 years ago, when the need for more passenger equipment became acute, it was found that passenger buses converted for meter-gage operation were particularly suited for this type of operation.

Several factors combined to make these converted buses the best solution to the passenger problem, the writers said:

1. Low first cost.
2. Automotive equipment is built light and powered for grade operation.
3. Fuel is available and reasonably cheap.
4. Automotive truck mechanics can maintain them.

Specifically, conversion included replacing the rear wheels with flanged steel wheels, and the front wheels with a small four-wheel guide truck, the authors explained. Front truck brakes were set by turning the steering wheel. Rear-axle springing was left much as is, but the front-wheel trucks required a slight modification to allow pivoting about a center kingpin. The frame rested on a cross elliptical spring.

Mounts Required Redesign

In 1937, however, redesign of the autocarril was deemed necessary due to the fact that the heavy railway mounting threw the light body around "rather like a tail wagging a dog," and the front end "nosed" in turning sharp radius curves, the authors said.

Car and trailer bodies similar to those used on recent U. S. school buses, carrying about 40 passengers, were mounted on Axless railroad trucks, they said. Originally devised in 1931 by the Differential Steel Car Co. of Findlay, Ohio, to make possible a low large-capacity coal mine car capable of high speed around sharp curves, the truck has shown much promise in its easy riding over rough track and around curves, as well as reduced rolling resistance, the writers said.

The Flowers brothers had an opportunity to make a personal check on the four meter-gage trains put in service in 1937, after three and one-half years of active use. Riding qualities were up to expectations, they said, although they could be improved by the use of anti-roll stabilizers, more recently developed for American installations of the Axless truck. The most obvious deficiency apparent was that of motive power; one truck engine by itself was not powerful enough to keep fast schedules on 3% grades, they declared.

1942 Model

Redesign of the Bolivian autocarril now in prospect envisions a train consisting of an axle-less motor car and trailer that will maintain a speed of 25 mph up a 3% grade, the authors said. If possible, all wheels are to be motor driven. Ninety passengers and 5400 lb of luggage will make up the 10 tons of live load in altitudes where engines deliver only 60% of their sea-level rating, the engineeering audience was informed.

"It has been decided to use *four* automotive engines, costing a few dollars per horsepower, as motive power," the authors said. "An Axless truck could be driven at each corner of the railcar with one engine. Through the use of a fluid coupling the problem of synchronizing transmissions, one that had been a stumbling block to previous multiple-engine installations, was automatically eliminated.

"The power unit chosen is the 147 hp Chrysler Eight passenger engine, which will be governed down to 125 hp at 2800 rpm," they continued. "To the standard engine, fluid coupling, and transmission unit is added Chrysler's 1.33-1 overdrive, used in the Airflows several years ago. The standard passenger engine, with necessary altitude adjustments is used for this service, since the smaller amount of power developed at high altitudes means a reduction in bearing loads.

Engines on "Floating Power" Mountings

"The engines on their 'floating power' mountings are suspended on each side of the center sill. Air is deflected through the

Up Where the Blue Begins

Wood-burning locomotives haul most of the Bolivian traffic, toiling over mountain routes climbing up to 16,000 ft. Most Bolivians live up there where all the tin and other metals are found. The principal cities nest from 9000 to 14,000 ft.

Airplanes are used today for much of the travel.

Bolivian rail equipment reflects 20-year-old engineering. Standards and interchangeability are almost unknown, but ingenious crews cope well with virtually any situation.

Modern autocarrils are good news for Bolivian travelers.

double-size radiators and out the side of the car. Since each intake is mounted under a pair of reversed seats, the body of the motor car may be kept low.

"The four engines speed the train up the ruling 3% grade at 30 mph with power to spare. On the level stretches operation in overdrive allows speeds up to 40 mph, and here two or three of the engines are turned off, so that the remaining engine or engines may supply the reduced power with less pumping loss through wider throttle openings. Since the free-wheeling is out when the overdrive is in, the motors may be used to help retard the train when coasting down the 3% grade. . . . All in all, the characteristics should fit the job remarkably well." (See p. 40.)

Axis Running Out of Nickel, Mudge Reports

▪ Indiana

A LARGE group of prominent technical men from factories throughout the Indiana Section territory were among the 125 engineers who attended the April 24 meeting at Indianapolis, Ind., some traveling as far as 150 miles round-trip. They came to hear Dr. William A. Mudge, assistant director, Technical Service International Nickel Co., Inc., speak on "High Nickel Alloys, Their Manufacture, Properties and Uses."

Since 85% of all nickel comes from Canada, America is assured of the bulk of the world's supply for war purposes, Dr. Mudge said. He expressed the belief that, aside from a relatively small amount of nickel obtained from German sources, there is little other supply available to our enemies.

Dr. Mudge presented a condensed sketch of early nickel history and the rapid rise of the relatively small nickel industry, through the impetus it received during World War I to the past few years when production has gone sky-high. By 1918, the tonnage had risen to 99,000,000 lb, Dr. Mudge said; this output doubled by '35 and, by '41, had reached 280,000,000 lb.

A sound picture, "Nickel Highlights," accompanied the talk. Prominent discussers included Robert P. Atkinson, Leroy V. Cram, and C. R. Paton, Allison Division, General Motors Corp.; Lee Oldfield, Merz Engineering Co.; and Harold S. Rogers with the WPB Indianapolis office.

Tulsa Now "Southwest Group"

THE name of the SAE Tulsa Group has been changed to the "Southwest Group" upon recent Council approval.

As a majority of those attending the Tulsa meetings are from southwestern points, it was felt that a change in name would better describe the expanding scope of the Group and constitute a constructive step in fostering its development.

SAE Participates in Nation-Wide Series of War Production Clinics

A SERIES of 10 War Production Clinics, sponsored by the SAE and five other engineering societies – the ASME, AIEE, AIME, AICE, and ASCE – and the Engineers Defense Board, are being held in industrial production centers throughout the country in the period between May 5 and June 4. These Clinics have been planned at the request, and with the active support, of the War Production Board for the purpose of "exchanging and disseminating information and experience on the engineering aspects of war production problems and the conversion of plants to war production."

Because the manufacture of war materials falls so largely within the scope of the ASME and the SAE, the organization and operation of the Clinics are being carried out largely by the local sections of these two societies cooperating through joint local committees.

More than 300 attended the initial War Production Clinic, held in Dayton, O., on May 5, where the Dayton Chamber of Commerce joined the six engineering societies in sponsoring the meeting. The afternoon session was featured by a keynote address: "Introduction to the Problems of Conversion," by George T. Trundle, Jr., president, Trundle Engineering Co. As meeting chairman, R. W. Gates, president, Air Pre-Heater Corp., read a special message from Donald M. Nelson, WPB chief.

Immediately upon adjournment of this session, the Clinic was divided into eight panel discussions held in separate rooms, to discuss problems and exchange information on the following production phases: machine shop, foundries, sheet metal, electrical, civil, tool making, welding, and chemical.

Summary reports of these panel discussions comprised the first event on the evening program following dinner. These reports were followed by two vitally informative talks: R. B. Spackman, vice president, Lyon Metal Products Co., told how one company is tackling the war production problem, and Col. Philip Schneeberger, U. S. Army Air Forces, discussed industrial planning in the present emergency.

Programs of the nine subsequent War Production Clinics are following the same general program pattern set by the initial Dayton meeting. Following the Dayton meeting, Clinics were held in Bridgeport, Conn., and Rockford, Ill., on May 25; Cincinnati, O., and Eastern Pennsylvania, on May 27; and Newark, N. J., on May 29. Additional Clinics are scheduled for Boston, Mass., and Minneapolis, Minn., on June 1; and Birmingham, Ala., and St. Louis, Mo., on June 4. R. M Gates has been designated chairman for the Bridgeport, Eastern Pennsylvania, Newark, Boston, and Birmingham Clinics; J. D. Cunningham, for the Minneapolis and St. Louis Clinics.

In addition to the six original sponsoring engineering societies, the Newark meeting, called the "War Production Conference," was sponsored by nine other organizations: the Army Ordnance Association, American Foundrymen's Association, American Society for Metals, Society of American Military Engineers, Society of Naval Architects and Marine Engineers, Institute of Radio Engineers, American Society of Tool Engineers, American Welding Society, and New Jersey Council. W. H. Harrison, director of production, War Production Board, was the featured speaker.

Among the speakers contributed by the SAE is Joseph Geschelin, SAE Vice President representing Production Engineering, who is scheduled to address the Bridgeport, Eastern Pennsylvania, and St. Louis meetings; Col. Roy M. Jones, Army Air Forces, and M. B. Gordon, vice president and general manager, Wright Aeronautical Corp., who spoke at the Newark Clinic. G. T. Trundle, Jr., is slated as speaker for the Rockford, Cincinnati, and Minneapolis Clinics.

Say Western Diesel Fuel Improved for High-Speed Engines

▪ Northern California

DEVELOPMENT of a highly-treated, low-viscosity, high-ignition quality fuel of western origin in current models of commercial high-speed, 4-cycle diesel engines was described in detail in a three-author paper delivered before 150 members and guests at the April 14 meeting of the Northern California Section. The authors were C. C. Moore, Dr. R. I. Mahan, and B. T. Anderson of the Research Department, Union Oil Co. of Calif. Dr. Mahan read the paper.

It was explained that Pacific Coast diesel fuels have been inferior to the products of eastern distillers due to the basic differences in the crude sources. As high-speed diesels came along, these fuels proved inadequate, the authors said, and improvements had to be made. The successful application of lubricant additive, they pointed out, opens new vistas to the western refiners for the development of the eventual optimum fuel for high-speed diesel engine use from western crude sources. It is along this line that most development has been achieved, they said.

"Other oil companies will verify the results reported by Dr. Mahan," stated William V. Hanley, Standard Oil Co. of Calif., in leading off discussion, "except the wear rate of injection equipment when using light viscosity fuel." Mr. Hanley reported that 1000 hr tests on certain makes of injection equipment showed no change in wear when using light fuels. Dr. Mahan replied that his tests had been made on a popular make of pump which was known to give trouble with light fuels, and that in every case this particular make of pump had seized after 40 min running when using light fuel without oiliness additives. "The fuel injection distributor disc is the point of most wear," he added in response to a question by Peter Glade, Purity Stores, Inc.

Continuing the discussion, Mr. Hanley pointed out that use of especially light fuels results in a loss of power due to their being fewer Btu's in the fuel, and due to a decrease in volumetric efficiency of the pump because of less sealing action by the fluid being pumped. Dr. Mahan replied that the more complete burning of the lighter fuels offset their decrease in Btu value.

J. M. Evans, Tide Water Associated Oil Co., questioned the economics of fancy refining of fuel to get rid of odor, smoke and other features which might be objectionable to certain makes or types of equipment, pointing out that an increase in refining costs and consequent increase in retail fuel

price reduces the advantages of diesel-engine operation. Dr. Mahan stated that the general trend is to increase the amount of refining of all petroleum products, and that the present development of a special diesel fuel is in line with similar development of gasoline fuels. Technical Chairman S. E. Onorato, Union Oil Co. of Calif., added that an increase in fuel cost could be justified by a reduction in overhaul costs, this latter being made possible by better combustion with less carbon and wear when using the lighter, more highly refined fuels.

In response to a question by Hans Bohuslav, Enterprise Engine & Foundry Co., Dr. Mahan advised that the addition of an oiliness agent to the light fuels would not materially increase their cost.

J. R. MacGregor, Standard Oil Co. of Calif., pointed out that contaminants dropped out of the light fuels more easily than from heavier fuels; but that if they once reached the engine they did more damage than if suspended in a heavier fuel.

Charles F. Becker, Tide Water Associated Oil Co., summed up the discussion by pointing out that there is a need for special fuels for special services, but that general transport operators object to the loss of power resulting from use of special fuels, and that a small amount of smoke may be tolerated. He continued with the statement that both fuel pump wear and piston crown scratching are problems to be solved by the metallurgist since there are some makes of equipment which stand up with no appreciable increase in wear when using the light fuels. He concluded with the statement that present war conditions limit the extent to which the oil companies can develop or supply special fuels unless the demand is very great or unless there is no other remedy which the engine manufacturer or fleet operator can apply.

Tell How Worn Parts Are Rebuilt by "Metallizing"

▪ Capital District Group

WORN metal surfaces on automotive crankshafts and similar parts can be rebuilt – in many cases with wearing qualities superior even to original surfaces – by the metallizing process, according to John E. Wakefield, Metallizing Engineering Co., Inc., and George A. Peabody, New York Power & Light Corp., in a two-paper round-up at the April 29 meeting of the SAE Capital District Group of Albany.

Defining metallizing as "coating with a metal or metallic compound," Mr. Wakefield went on to describe the wire spray gun now commonly used to apply the metal coating and the preparation of the metal surface to which the coating is to be applied.

Open-Grain Structure Advantageous

The metallizing surface has an open-grain structure consisting of a multitude of flattened particles keyed into each other, Mr. Wakefield said. Since the principal disadvantage of this open grain is a material reduction in the tensile strength, metallizing cannot be used safely for building up gear teeth, threads, or races against which balls or rolls are run, he said. Its compressive strength, however, is so high that it can be used on bearing surfaces and the like, he said, adding that the open grain also has a distinct advantage in absorbing and holding oil.

Mr. Wakefield summarized the advantages of metallizing as:

Greater speed, with resulting lower costs.

Greater versatility in a choice of metals.

Absolute protection from stresses and distortion.

Better lubrication.

Metallizing Proves Solution

Great success in repairing cavitated waterwheel runners by the metallizing process was claimed by George A. Peabody, superintendent of mechanical maintenance of the New York Power & Light Corp. in the Eastern Division of Niagara Hudson Power Corp. After experimenting with various welding methods, runners which were continuously pitted year after year were metallized with Metcoloy No. 2 stainless steel, with a result that after four years of constant operation they still show perfect results, Mr. Peabody said.

Repairs World's Largest Waterwheel

"Ten years ago, the largest waterwheel in the world was installed at our Spier Falls Hydro Plant on the upper Hudson River," Mr. Peabody said, in describing a typical case study. "This wheel is 20 ft in diameter and weighs 150 tons. Under full load, 4 billion gal of water pass through it every 24 hr to generate some 57,000 hp.

"About three years after installation, all discharge edges of the runner blades were found badly pitted from ½ to ¾ in. deep, for a length extending from the edge of the runner band toward the center.

"Repairs were effected by metallizing, using Metcoloy No. 2 wire. The metallizing was carried on with two 12-hr shifts, two men on each shift, and required seven 24-hr days, and a total of 412 lb of Metcoloy No. 2. (Amount of metal sprayed on each of 15 blades ranged from 10 to 81 lb.) The unit was taken out of service at midnight, March 6, 1940, and put back into service on March 16, 1940, at 1:42 p.m.

"I would say the results we are getting are very satisfactory," Mr. Peabody said in conclusion, "and we are doing the work in about half the time and cost of our original welding work, and with much better results."

Restoring worn bearing surfaces on a worm shaft for a Twin Coach with a metallizing gun. Before metal is sprayed, the bearing surface is roughly grooved to ensure metal particles keying into one another. After metal surface has been built up oversize, it is machined smooth with a blunt-nosed tool

Post-War Car Predictions Given at Final Meeting

▪ New England

MOTORISTS may expect to find post-war cars with engines in the rear; sliding doors, possibly going up over the top or disappearing some other way; and more driver vision with elimination of present type hoods and fenders, according to discussion arising at the final meeting of the New England Section, May 14, at the Engineers Club.

Junking with Care

Chairman H. B. Hawk arranged an innovation by having all six meeting speakers members of New England Section. James T. Sullivan introduced the speakers. William M. Clark, speaking on transportation, said the war will create conditions similar to early days when parts were saved and used over when necessary. With some parts hard to get for big fleets closer check on vehicles will be necessary. The prodigal era of junking slightly-used units has ended, he said.

Alfred Marcus discussed service problems and outlined how it is possible to build up a business by surveying a territory, and then to create a flexible plan to meet changing conditions at different periods so that the volume will not drop to endanger a net profit.

Gear Ratios Not Right

Lucius Ryce, who spoke on economical operation, supplied data based on accurate figures he kept during five years, from 1938 to 1942, inclusive, when he toured from ocean to ocean four times with a total mileage of 179,404 in all kinds of climate and weather. He said if a car were what it could be it would not have in high and second gear the overall gear ratios now usual. Mr. Ryce had changes made in his car to create economy.

Arthur W. Stevens, who has been crusading for rear-engine cars some years, read a paper giving facts that he said showed lack of vision in front of cars was responsible for so many deaths and injuries on the highways.

He said that present cars were built to

meet a demand created by well-written advertising, adding, however, that to make a change-over to rear engines with drivers up front instead of the middle of cars would be a difficult task. With all '42 models' tools and dies scrapped or converted, it might be done when the war ends, he said.

M. R. Wolfard, talking on carburetion, explained the development of getting units which could accomplish mixing air and gasoline to function properly. He told of the problems that faced those who were engineering carburetors, and how failures were overcome.

Alfred W. Devine, who read Joseph Fortal's paper on ignition, gave minute details on the fundamentals of proper coordination of various parts comprising the electrical units on a car. He amplified it with a sketch.

Signal Corps to Clarify Questions on Radio Installation

DURING a discussion of installation, testing, and inspection of radio equipment in military tactical and combat vehicles at the April 24 meeting of the SAE Committee on Radio Interference in Detroit, a number of questions were raised by the representatives of vehicle and equipment companies, U. S. Army Signal Corps, Ordnance Department, and Quartermaster Corps. It was agreed at the meeting that the best way to handle these questions is to have them submitted in writing so that answers could be prepared for discussion at the next meeting of the Committee.

As a result, the Committee sent out forms to the vehicle and equipment manufacturers of tactical and combat vehicles, asking them to list all questions that they may have regarding the radio communication equipment on military vehicles pertaining to design, installation, tests, acceptances, and so on, and send them in to SAE headquarters.

These questions have been transmitted by the Society to the U. S. Army Signal Corps for study in order to have prepared answers ready for the next meeting of the SAE Committee on Radio Interference. The Signal Corps Laboratories are securing directly through government services answers to their own questions relating to manufacture and delivery of this equipment.

The objective of this procedure is to bring out the difficulties that vehicle and equipment manufacturers have experienced in meeting test performance requirements in installing and shielding radios, and in obtaining acceptances by the military services.

Motion Picture – "Streamlined" Draws Large Engineering Group

▪ SAE Club of Colorado

APPROXIMATELY 275 engineers and students attended the April 28 meeting of the SAE Club of Colorado. Held in the University of Colorado in Boulder, the meeting was arranged for the engineering students at the University.

After a cordial welcome from the faculty, a motion picture entitled "Streamlined" was shown through the courtesy of Thompson Products, Inc. This picture included the history of automobile racing, aviation development, and the production methods used by Thompson Products.

G. N. Gromer, formerly chairman of the club, gave a talk on the activities of the SAE from the student's viewpoint. Following the picture the group was taken through some of the University's engineering laboratories for an inspection of the equipment.

SAE Student Branches

CCNY – April 8

STEEL mats and a soil treatment process – in which a small proportion of cement is mixed with natural earth – were two new methods of airport construction mentioned by Emil K. Harvey, Haller Engineering Co., in his talk.

The trend toward longer runways to meet the needs of large bombers was also discussed by Mr. Harvey. Expanding present small airfields for this purpose involves several problems, he reported, of which drainage is among the most important. In addition, he said, distant buildings might make it necessary to realign the extended runways.

Mr. Harvey is not entirely in favor of the proposed highway strips since wind direction determines which of an airport's runways a landing plane must use and landing strips would offer no choice.

CCNY – April 22

In the period 1941-42, diesel horsepower production increased about eight times, and increased unit production reduced the cost of the injector mechanism by one-half, Rex W. Wadman, editor of *Diesel Progress*, told members of the CCNY student group.

The opposed-piston diesel has been successfully used in the Junkers transport plane, Mr. Wadman said. Due to the fact that it requires one-half as much fuel as a gasoline engine of the same horsepower, it has an obvious weight-saving advantage during long flights, he said, adding that it isn't adapted to fast, short-range fighters.

While the initial cost of the diesel is higher than that of the gasoline engine, Mr. Wadman said that the diesel is more economical in the long run.

CCNY – April 29

On April 29, William Hargest, associate editor of *American Machinist*, discussed aircraft manufacture, combustion, and fuel mixtures before the SAE group at CCNY. Among the points mentioned in his motion-picture-illustrated talk were the proper use of take-off power, the cooling effect of a rich mixture, and slow-motion studies of detonation.

Cooper Union – May 13

At the closing meeting of the SAE Club at Cooper Union, School of Engineering, Dean George F. Bateman presented an award to David Miller '42, chairman of the Club, for having done the most for the Club in the past year. During this, the first year of the Club's existence, due to Mr. Miller's leadership, the Club has carried out a very active program, which included presentation of papers by outstanding men from the automotive and the aircraft industry at monthly meetings.

GM Institute – April

An inspection trip through the Pontiac Motor Division 20-mm Oerlikon Gun Plant at Pontiac, Mich., comprised the April meeting of the student branch. The students viewed at first hand both the intricacies of gun mechanisms and the adaptations of special machinery used in the manufacture of those parts. Through the cooperation of the Pontiac Motor Division and the Naval Ordnance, competent guides were provided on the tour.

Aircraft Designer Forecasts Post-War Private Airplane

▪ Southwest Group

"WHAT will the post-war plane be like?" was answered in prophecy by Al Mooney, noted plane designer, and chief engineer, Culver Aircraft Corp., at the April 17 meeting of the Southwest group, at the Mayo Hotel, Tulsa, Okla.

After tracing private plane development from its embryonic state following World War I up to the present day, he drew on his broad aviation experience to sketch mentally for his engineering audience the plane of the future.

Lists Post-War Plane Features

Confining discussion to private airplanes for buyers of moderate means, Mr. Mooney foresaw, among other features:

Two-place, and four-place "sedan" airplanes similar to automobile arrangements

Stall control independent of movable flaps, slots, and the like

Manual or automatically controllable propellers

Full electrical starting, generating, and lighting on all but inexpensive models

An accelerometer, or instrument informing the pilot of structural loads imposed on airplane for maneuvers and gusty air

A two-way radio eventually in every airplane, with some form of radio compass.

Light Amphibian Designer Will be Famous

Fame and fortune await the designer who can evolve a really successful light amphibian, which will have performance and economy comparable to those of landplane models, Mr. Mooney said at another point in his talk. Much engineering energy will be expended on the problem, he prophesied, and added that until the appearance of a successful amphibian, the two-float light seaplane will find increasing favor especially in view of recent developments tending to reduce the cost of such float installations.

SAE Represented on ASTM Cartridge Brass Project

TWO SAE representatives have been appointed to the Section on Indentation Hardness of ASTM Committee E-1 on methods of Testing, for the purpose of coordinating the work on conversion tables for hardness numbers being carried on by divisions of the SAE Standards Committee and the ASTM. T. H. Wickenden, The International Nickel Co., Inc., represents the Iron and Steel Division, and H. W. Luetkemeyer, the Non-Ferrous Metals Division, of the SAE Standards Committee.

Among the important war projects handled by this Section has been the preparation of hardness conversion relations for cartridge brass. These relations are the result of a series of round-robin tests conducted at the laboratories of the Frankford Arsenal, American Brass Co., American Rolling Mill Co., Wilson Mechanical Instrument Co., and Bell Telephone Laboratories.

As a result, a hardness conversion table for cartridge brass was compiled and approved by the Section on Indentation Hardness for presentation to the ASTM in June for publication as an ASTM Standard. The "Proposed Hardness Conversion Table for Cartridge Brass," is published on pp. 35-36 of the March, 1942, *ASTM Bulletin*. It is planned subsequently to prepare similar hardness conversion tables for heat-treated steels and other materials.

SAE Coming Events

Sept. 24 – 25 National Tractor Meeting
Hotel Schroeder – Milwaukee, Wis.

Chicago – No meeting

Detroit – June 8 and 19

June 8 – Cooperation in joint SAE-ESD "War Production of Aircraft" Meeting (see pp. 24 and 25).

June 19 – Oakland Hills Country Club. Golf during afternoon. Dinner 8:00 p.m. Ladies night.

Kansas City – June 22

Hotel Continental, dinner 6:30 p.m. Design Features and Performance Characteristics of the Mercedes-Benz DB-601A Aircraft Engine – Raymond W. Young, chief engineer, Wright Aeronautical Corp. Engine on exhibition.

Milwaukee – No meeting

Northern California – June 9

Open Forum on Transportation and Maintenance.

Oregon – June 12

Inspection trip of Portland Traction Co. Shops, 4100 S. E. 17th Ave., Portland; 8:00 p.m. Talks by Gordon G. Steele, president; J. P. Tretton, Jr., superintendent of equipment; Earl B. Richardson, chief inspector; Bruce Ogden, bus shop foreman.

Pittsburgh – No meeting

St. Louis – June 25

Candlelight House, dinner 6:30 p.m. Design Features and Performance Characteristics of the Mercedes-Benz DB-601A Aircraft Engine – Raymond W. Young, chief engineer, Wright Aeronautical Corp. Engine on exhibition.

Southern California – June 5

Hollywood Athletic Club, Los Angeles. Trends of Ocean Flying Conditions. Speaker to be announced. Technical Chairman: T. D. MacGregor, liaison engineer, Douglas Aircraft Co., Inc.

About SAE Members

(*Continued from page* 37)

ADAM K. STRICKER, JR., has been given a leave of absence from the staff of **ALFRED P. SLOAN, JR.,** chairman, General Motors Corp., to join the Army as Senior Industrial Specialist, Signal Corps, U. S. Army, Washington, D. C. A former member of the Detroit Section, he later was vice chairman for the Passenger-Car Activity, also served a term as chairman of the Meetings Committee of the Metropolitan Section.

VAN TURNER, editor of Chexall Division, The Chek-Chart Corp., Chicago, and before that on the editorial staff of the Chilton Co., Philadelphia, has been commissioned a first lieutenant in the Army Air Force. He has been assigned to duty at the Advanced Flying School, Stockton, Calif.

LOUIS REZNEK, formerly assistant mechanical engineer, Interstate Commerce Commission, Bureau of Motor Carriers, Washington, is now in the Sixth Armored Division, Company C, Maintenance Battalion, Camp Chaffee, Ark.

Formerly Canadian representative of Hupp Motor Car Corp., Detroit, **E. P. CLARKSON** is now inspecting officer, Small Arms Division, Inspection Board of United Kingdom and Canada.

HARRY T. AHRENS has been loaned to the Automotive Field Service and Armament Division of the Ordnance Branch to work with Col. Morris K. Barroll, assistant chief. For the past six months he has been guest lecturer at all the motor transport schools on engine analysis and trouble shooting, and has helped officers set up maintenance companies. Upon completing his work for the Ordnance Branch, he will resume the lecture tours for the Quartermaster and Ordnance schools and posts. In civilian life Mr. Ahrens was technical supervisor, Hygrade Products Co., Inc., Long Island City, N. Y.

Formerly a sales engineer at Vultee Aircraft, Inc., Vultee Field, Calif., **FRANK CLIFTON RACHAL, JR.,** is now a staff sergeant in the Signal Corps of the U. S. Army.

2nd LT. JOHN R. HOWARD, III, has been called to active duty with the Ordnance Department, Ordnance Training Center, Aberdeen, Md. He had been research engineer in the research laboratories of the Ethyl Gasoline Corp., Detroit.

A leave of absence has been granted **HARVIE H. STRAWN** by the International Harvester Co., Boston, where he was service manager. He enlisted in the Army Air Corps, and is now a first lieutenant, stationed at Randolph Field, Tex.

J. FLOYD SMITH is stationed at Fort Francis E. Warren, Cheyenne, Wyo., U. S. Quartermaster Corps, where he is senior instructor in the Motor Maintenance School. Prior to this he was service supervisor, Toney Chisum, Inc., Amarillo, Tex.

University of Wisconsin graduate **WARREN L. SOMMER** is a second lieutenant in the Corps of Engineers, Alexandria, Va.

George L. Norris

George L. Norris, chief metallurgist of the Vanadium Corp. of America, New York City, died at Roosevelt Hospital, New York, April 13. He was 76 years old. He was one of the pioneers in the development and application of vanadium. In 1909 he joined the American Vanadium Co., and remained with this company when it became the Vanadium Corp. of America. He was in active service until the time of his death.

Gustave A. Goesele

Gustave A. Goesele, who joined the Society 18 years ago, was killed on or about Feb. 26 in an airplane accident enroute from Bombay, India, to Teheran, Iran. He joined General Motors Overseas Operations in December, 1925. For the first six months of 1941 he was loaned by General Motors to serve as an automotive parts specialist in the U. S. Army Ordnance Department, and returned to his company on July 12 as a truck specialist.

He sailed on Aug. 30, 1941, for India when he was assigned to General Motors India, Ltd. The rigors of the tropical climate caused his wife to return to her home in Pennsylvania soon after his arrival in India.

Robert F. Vogt

Robert F. Vogt, chief consulting engineer of the Allis-Chalmers Mfg. Co., Milwaukee, died April 17, at the age of 62. Mr. Vogt came to Milwaukee 40 years ago from Geneva, Switzerland, his birthplace, and was associated with Allis-Chalmers for the past 36 years.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between April 15, 1942, and May 15, 1942.
The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section

Cook, Arthur J. (J) engineer (laboratory), Glenn L. Martin Co., Middle River, Md. (mail) 1602 Roundhill Rd., Baltimore.

Tompsett, Elliot W. (SM) junior engineer (automotive), U. S. Army, Ordnance Dept., Aberdeen Proving Ground, Aberdeen, Md. (mail) 210 Senaca Ave., Havre de Grace, Md.

Buffalo Section

Cliborn, Robert (J) test engineer, Chevrolet Motor Division, General Motors Corp., River Rd., Tonawanda, N. Y. (mail) 1418 Sheridan Dr., Kenmore, N. Y.

Heuss, Leon A. (J) engineer, Curtiss-Wright Corp., Airplane Division, Buffalo, N. Y. (mail) 42 Philadelphia.

Jepson, Karl H. (M) supervisor, engineering tests, Chevrolet Aviation Engine Division, General Motors Corp., Tonawanda, N. Y. (mail) 1470 Sheridan Dr., Kenmore, N. Y.

Thomas, Harold Wm. (J) test pilot, assistant chief experimental pilot, Curtiss-Wright Corp., Airplane Division, Buffalo, N. Y. (mail) 49 Englewood Ave.

Wunsch, Charles W. (A) instructor, National Defense Training School, Plattsburg, N. Y. (mail) 108 Mayville Ave., Kenmore, N. Y.

Canadian Section

Anglin, Arthur Baker (M) manager, technical service, British American Oil Co., Ltd., Royal Bank Bldg., King & Yonge Sts., Toronto, Ont.

Beattie, Frank S. (M) Reo Motor Co. of Canada, Yorkville Ave., Toronto, Ont.

Chester, Jack (A) owner, 1075 Mountain St., Montreal, Quebec (mail) 1222 Dorchester St., West, Apt. 5.

Meschino, Ronald G. (J) tool engineer, Aircraft Division, National Steel Car, Ltd., Malton, Ontario (mail) 403 Roehampton Ave., Toronto, Ont.

Chicago Section

Bird, Paul G. (M) research director, National Aluminate Corp., 6216 W. 66th Pl., Chicago.

Fairlie, M. (M) Sinclair Refining Co., East Chicago, Ind.

Haase, Elmer August (J) redesign and development engineer, Bendix Aviation Corp., Stromberg Aircraft Carburetor Division, 401 N. Bendix Dr., South Bend, Ind.

Huber, Max N. (J) project engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. (mail) 419 Lincoln Way West, Mishawaka, Ind.

Payne, Frank E. (M) president, Crane Packing Co., 1800 Cuyler Ave., Chicago.

Pocock, Robert C. (J) engineer, Bendix Products Division, Bendix Aviation Corp., 401 N. Bendix Dr., South Bend, Ind.

Waters, Calvin G. (A) midwest district manager, Wico Electric Co., Springfield, Mass. (mail) 160 E. Illinois St., Chicago.

Yeoman, William D. (J) junior engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind. (mail) 419 Lincoln Way West, Mishawaka, Ind.

Cleveland Section

Beatty, Robert D., Jr. (M) chief engineer, heater division, Eaton Mfg. Co., 739 E. 140th St., Cleveland (mail) 3645 Traynham Rd., Shaker Heights, O.

Beecher, Eugene L. (M) chief engineer, Gabriel Co., Cleveland (mail) 2155 Demington Dr., Cleveland Heights, O.

Elliott, W. H. (M) manager, tire development department, B. F. Goodrich Co., Dept. 6125, 500 S. Main St., Akron, O.

Glanzer, Clarence J. (M) test and development engineer, Air-Maze Corp., 5200 Harvard Ave., Cleveland.

Jividan, Edwin P. (A) production superintendent, Burgess Co., 3650 E. 93rd Rd., Cleveland (mail) Regent Hotel, E. 105th & Euclid.

Klein, L. W. (A) vice president, Gabriel Co., 1307 E. 40th St., Cleveland.

Kropf, Richard Bartlett (M) field superintendent, Copperweld Steel Co., Warren, Ohio.

Meredith, Covert B. (J) assistant chief engineer, Jack & Heintz, Inc., Bedford, Ohio.

Minshall, Robert J. (M) president, Pump Engrg. Service Corp., 12910 Taft Ave., Cleveland.

Patterson, Ian David (M) development engineer, Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, Ohio.

Schwartz, W. H. (J) chief engineer, Lester Engrg. Co., 2711 Church Ave., Cleveland.

West, William H., Jr. (M) assistant to plant manager, Thompson Aircraft Products Co., Euclid, Ohio.

Dayton Section

Conrard, Donald (J) carburetion test inspection, Wright Aeronautical Corp., Division of Curtiss-Wright Corp., Cincinnati (mail) 2737 Arbor Ave.

Neubeck, William F. (M) fleet maintenance superintendent, Donaldson Baking Co., 42 S. Fourth St., Columbus, O.

Parsons, Richard (J) senior test engineer, Wright Aeronautical Corp., Division of Curtiss-Wright Corp., Cincinnati (mail) 631 Burns Ave., Wyoming, O.

Whitfield, J. E. (M) designer, General Machinery Corp., Hamilton, O. (mail) P. O. Box 205.

Detroit Section

Ayers, Chalmers (J) methods engineer, Long Mfg. Division, Borg-Warner Corp., 12501 Dequindre, Detroit (mail) 17 Bartlett Ave., Highland Park, Mich.

Clark, Robert E. (J) automotive engineer, Chrysler Corp., 12800 Oakland Ave., Highland Park, Mich. (mail) 16141 Appoline, Detroit.

Cowgill, Wilmer D. (A) salesman, Cleveland Graphite Bronze Co., Cleveland, (mail) 7-169 General Motors Bldg., Detroit.

Griese, William B. (M) plant manager, Liquid Cooled Engine Division. Aviation Corp., Williamsport, Pa. (mail) 2458 Kenwood Blvd., Toledo, O.

Hammond, John G. (A) regional engineer, Metallizing Engrg. Co., Inc., 6432 Cass Ave., Detroit.

Hiersch, Frederick A. (M) instructor, mechanical engineering department, University of Michigan, Ann Arbor, Mich. (mail) 1113 Willard St.

Hollar, Arthur W., Jr. (J) engineer, Wilcox-Rich Division, Eaton Mfg. Co., 9771 French Rd., Detroit.

Johnson, Russell S. (A) engineering representative, Eclipse Machine Division, Bendix Aviation Corp., 8-212A General Motors Bldg., Detroit.

Johnstone, Theodore H. (A) research engineer, Yale & Towne Mfg. Co., 2679 E. Grand Blvd., Detroit (mail) 100 Glynn Court.

Kelly, Frederick J. (M) metallurgist, Wilcox-Rich Division, Eaton Mfg. Co., 9771 French Rd., Detroit.

Kemp, Kenneth J. (A) assistant manager, Holland Precision Parts Division, Bohn Aluminum & Brass Corp., Holland, Mich.

Lendway, Joseph M. (A) manager, lubrication oil sales, Shell Oil Co., Inc., 900 Griswold Bldg., Detroit (mail) 294 Drexel Ave.

Noble, Donald A. (A) sales engineer, Titeflex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J. (mail) 5-210 General Motors Bldg., Detroit.

Powers, Milton A. (M) chief engineer, Timken Silent Automatic Division, Timken-Detroit Axle Co., Detroit (mail) 325 Fiske Dr.

Ryan, Edward F. (A) sales engineer, Johnson Bronze Co., S. Mill St., New Castle, Pa. (mail) 16718 Archdale St., Detroit.

Salisbury, Glen D. (A) district manager, Phoenix Oil Co., 9505 Cassius Ave., Cleveland (mail) 6432 Cass Ave., Detroit.

Schlosser, Arthur G. (M) vice president, chief engineer, Candler-Hill Corp., 405 Midland, Detroit.

Smith, V. C. (A) president, Auto Parts Co., Inc., 121-123 N. Ashley St., Ann Arbor, Mich.

Stinson, Forrest A. (J) sales engineer, Delco-Remy Division, General Motors Corp., 8-162 General Motors Bldg., Detroit.

Thill, Walter E. (M) assistant design engineer, Federal-Mogul Corp., Detroit (mail) 11031 Shoemaker Ave.

Indiana Section

Nicholson, Thomas A. (M) engineering department, Perfect Circle Co., Hagerstown, Ind.

Reiners, Neville M. (M) design engi-

Manly Award Amendment

The Council has approved the amendment to the Manly Memorial Medal Rules of Award to require that an award is to be made only in the event of a unanimous decision of the Board. The new ruling will be effective in 1943.

neer, Cummins Engine Co., Columbus, Ind. (mail) Rio Plaza Apt. 3.

Rigsbee, Clifford M. (A) service manager, L. S. Ayres & Co., 1 W. Washington St., Indianapolis (mail) 1121 Newman St.

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Kansas City Section

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Metropolitan Section

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Davis, Harold J. (A) High School instructor, Board of Education, Brooklyn High School of Automotive Trades, 50 Bedford Ave., Brooklyn, N. Y.

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Fegley, Frederic C. (M) chief, service division, Brewster Aeronautical Corp., Long Island City, N. Y.

Fusselman, Wilbur Frank (M) production engineer, Titeflex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J. (mail) 72 Orchard Rd., Maplewood, N. J.

Hardgrove, Thomas H. (J) mechanical engineer, Sperry Products, Inc., Hoboken, N. J. (mail) 80 Laurel St., Ridgefield Park, N. J.

Harkleroad, Ivan (J) supervisor, experimental test, Wright Aeronautical Corp., Division of Curtiss-Wright Corp., Paterson, N. J. (mail) Alps Rd., R.F.D. 2.

Hoag, Harry James, Jr. (J) engineering trainee, Wright Aeronautical Corp., Division of Curtiss-Wright Corp., Paterson, N. J. (mail) 162 Alexander Ave., Upper Montclair, N. J.

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Kraemer, Herman C. (A) manager, carburetor division, Tire Trading Co., Inc., 239 Halsey St., Newark, N. J.

Moore, Boardman W. (J) engineering trainee, Wright Aeronautical Corp., Division of Curtiss-Wright Corp., Paterson, N. J. (mail) 65 Cedar Ave., Montclair, N. J.

Moreland, William J. (A) dynamometer operator, Gulf Oil Corp., 17 Battery Pl., New York City (mail) 23 Post Ave.

Murdoch, Kenneth (J) aeronautical engineer, American Export Airlines, Inc., 25 Broadway, New York City (mail) 400 E. 59th St., Apt. 15E.

Palermo, John J. (J) junior engineer, Simmonds Aerocessories, Inc., 21-10 49th Ave., Long Island City, N. Y. (mail) 669 Grand St., Brooklyn, N. Y.

Petre, William J. (J) draftsman, Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

Simon, Jack J. (J) laboratory tester, International-Plainfield Motor Co., Plainfield, N. J. (mail) 136 Davenport St., Somerville, N. J.

Smith, Hugh L. (M) vice president, operations, American Airlines, Inc., Municipal Airport, Jackson Heights, L. I., N. Y.

Milwaukee Section

Bondehagen, Melvin N. (M) chief engineer, Maysteel Products, Inc., Mayville, Wis.

Marchese, Carl (A) partner, superintendent, Marchese Bros. Engrg. Co., 1133 S. First St., Milwaukee.

Marchese, Tudy (A) partner, superintendent, Marchese Bros. Engrg. Co., 1133 S. First St., Milwaukee.

New England Section

Guillaume, Ernest M. (M) vice president, treasurer, Felters Co., Inc., 210 South St., Boston.

Heiber, Gustav (M) superintendent, bus maintenance, Boston, Worcester & New York Street Railway Co., Framingham, Mass. (mail) 855 Worcester Rd.

Hourihan, Timothy Joseph (A) transportation superintendent, Moulton & Holmes, 1033 Massachusetts Ave., Boston.

Parish, Harold C., Jr. (A) laboratory assistant, Commercial Filters Corp., 18 W. Third St., South Boston, Mass. (mail) 15 Winthrop St., Winchester, Mass.

Streid, Dale D. (J) design engineering, General Electric Co., 920 Western Ave., West Lynn, Mass.

Wenger, Edward J. (A) owner, Car-

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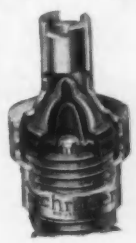

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Wilson, Steven B. (M) president, Fram Corp., Rumford P. O., East Providence, R. I.

Northern California Section

Sherman, Earl H. (M) owner, Earl Sherman & Co., 2526 Wood St., Oakland, Calif.

Northwest Section

Pearson, Wendell H. (J) armament engineer, Boeing Aircraft Co., Seattle, Wash. (mail) 900 Queen Anne Ave.

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Oregon Section

Everist, Melvin S. (A) Everist & Sons Garage, Portland, Ore.

Philadelphia Section

Hurleman, Walter A. (M) design engineer, Jacobs Aircraft Engine Co., Pottstown, Pa.

Meyer, Charles Ross, Jr. (A) sales and service engineer, Zenith Carburetor Division, Bendix Aviation Corp., 3621 N. Broad St., Philadelphia.

Rath, Harry Brinker (J) experimental test engineer, Mack Mfg. Corp., Allentown, Pa. (mail) 5834 N. Camac St., Philadelphia.

Robinson, William P. (J) test engineer, Jacobs Aircraft Engine Co., Engrg. Dept., Plant No. 2, Pottstown, Pa.

Snedeker, Thomas (J) inspector, petroleum products, U. S. Navy, Wilmington, Del. (mail) 1218 French St.

Zisette, R. R. (M) assistant sales manager, S K F Industries, Inc., Front St. & Erie Ave., Philadelphia.

Pittsburgh Section

Godden, Harold C. (A) branch manager, White Motor Co., 468 Melwood St., Pittsburgh.

Kenny, Joseph (A) owner, Kenny Cartage Co., 101 E. Carson St., Pittsburgh.

St. Louis Section

Hines, Lee D. (M) automotive engineer, Sinclair Refining Co., 13th & Gratiot, St. Louis, Mo.

Southern California Section

Howard, Thomas D. (M) national user salesman, International Harvester Co., 4501 S. Alameda St., Los Angeles (mail) 3877 Franklin Ave.

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Lawson, Gordon Charles (J) aeronautical engineer, Lockheed Aircraft Corp., Burbank, Calif. (mail) 1201 N. Downey Ave., Downey, Calif.

Petersen, Edward M. (A) transportation superintendent, Wilson & Co., Inc., 960 N. Vignes St., Los Angeles (mail) 3004 Bellevue Ave.

Reynolds, Harry V. (M) president, Pacific Aviation, Inc., 927 N. Sycamore Ave., Los Angeles.

Sanders, Ray (M) vice president, general manager, Turco Products, Inc., 6135 Central Ave., Los Angeles (mail) P. O. Box 2649, Terminal Annex.

Sellstrom, Lawrence T. (A) shop foreman, Knudsen Creamery Co., 1957 Santee St., Los Angeles (mail) 6023 Eileen Ave.

Woodhead, Harry (M) president, Consolidated Aircraft Corp., Lindbergh Field, San Diego, Calif.

Southern New England Section

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Southwest Group

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Syracuse Section

Loomis, Philip LeRoy, 1st Lt. (J) instructor, U. S. Army, Military Dept., Cornell University, Barton Hall, Ithaca, N. Y.

Rutishauser, Hans (J) designer, American Locomotive Co., Diesel Division, Auburn, N. Y. (mail) 12 Fort St.

Washington Section

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Sather, Bernard I. (J) assistant mechanical engineer, National Advisory Committee for Aeronautics, Langley Field, Hampton, Va. (mail) 130 Greenbriar Ave.

Outside of Section Territory

Ackerman, Virgil D. (A) automotive engineer, piston ring development, Hastings Mfg. Co., Hastings, Mich.

Almy, Gerald R. (J) U. S. Army, Second Battalion, 47th Q.M. Regiment, Fort Sill, Okla.

Bailey, D. Phillips (M) automotive engineer, field work, Tide Water Associated Oil Co., 11 N. Pearl St., Albany, N. Y. (mail) 11 Forest Rd., Delmar, N. Y.

Brogger, Charles C. (J) aeronautical engineering and drafting, Camfield Mfg. Co., 718 N. Seventh St., Grand Haven, Mich.

Enblom, John C. (J) assistant chief engineer, Donaldson Co., Inc., 666 Pelham Blvd., St. Paul, Minn. (mail) 4420 Edmund Blvd., Minneapolis.

Faust, William S. (J) vibration engineer, Lycoming Division, Aviation Corp., Williamsport, Pa. (mail) 1804 Memorial Ave.

Gaspari, Hannibal J. (J) research chemist, Yale Oil Corp., Billings, Mont.

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Hess, Everett J. (J) charge of radial engine test equipment, Buda Co., Harvey, Ill. (mail) 1056 High St., Williamsport, Pa.

Manley, St. Clair L. (A) service manager, Smyth & Arnold, Oakbank, Manitoba, Canada.

Ritchie, Allan V. (A) superintendent, research laboratories, The Texas Co., Beacon, N. Y. (mail) Box 509.

Sandham, Edwin C. (J) experimental engineer, Dow Chemical Co., Midland, Mich. (mail) 512 Litchfield, Bay City, Mich.

Teetor, Ralph J. (M) president, general manager, Cadillac Malleable Iron Co., Cadillac, Mich.

Victor, M. Thomas (J) sales engineeer, Keystone Carbon Co., St. Marys, Pa. (mail) 1135 State St.

Wallace, John J. (J) assistant chief engineer, Bristol Aircraft Division, Universal Moulded Products Corp., Bristol, Va. (mail) 904 Seventh Ave., Bristol, Tenn.

Work, Edgar A. (M) chief engineer, Lancaster Lens Co., 220-226 W. Main St., Lancaster, O.

APPLICATIONS Received

The applications for membership received between April 15, 1942, and May 15, 1942, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section

Hovgard, **Paul E.,** chief designer, The Glenn L. Martin Co., Baltimore.

Leonberger, **Walter S.,** partner, Duke Electric Co., Baltimore.

Buffalo Section

Askin, Joseph, chief engineer, Fedders Mfg. Co., Inc., Buffalo.

Moore, Richard E., engineer, Bell Aircraft Corp., Buffalo.

Queen, Roy Lee, assistant engineer, U. S. Army, Air Corps, Chevrolet Motor & Axle Division, General Motors Corp., Buffalo.

Canadian Section

Falkenhagen, Lloyd J., sales manager, Joseph Stokes Rubber Co., Ltd., Welland, Ont.

Phillips, Clifford Edwin, district manager, Perfect Circle Co., Ltd., Toronto, Ont.

Lace, George Sutton, engineer officer, Aircraft Production Branch, Department Munitions & Supply, Ottawa, Ont.

Wood, Gordon Lewis, salesman, territory supervisor, British American Oil Co., Ltd., Pembroke, Ont.

Chicago Section

Davis, Jack E., junior mechanical engineer, U. S. Army Air Corps, Buick Motor Division, General Motors Corp., Melrose Park, Ill.

Thrush, Jesse J., chief inspector, U. S. Army, Ordnance Department, Chicago.

Zeisloft, Harry C., Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Cleveland Section

Barrett, George N., Jr., metallurgist, Cleveland Pneumatic Tool Co., Cleveland.

Lucas, Julius A., development engineer, Goodyear Tire & Rubber Co., Akron, Ohio.

Scully, Hubert Lawrence, branch manager, Ohio Ball Bearing Co., Canton, Ohio.

Zimmerman, H. A., engineer, The Weatherhead Co., Cleveland.

Dayton Section

De Roze, Louis, project engineer, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Cincinnati, Ohio.

Schaefer, William E., draftsman, General Machinery Corp., Hamilton, Ohio.

Detroit Section

Allten, Arthur W., inspector in charge, U. S. Army Air Forces, War Department, Mail: Continental Aviation & Engineering Corp., Detroit.

Andersen, Harold, standards section engineer, General Motors Corp., Detroit.

Bigos, Walter, project engineer, Continental Aviation & Engineering Corp., Detroit.

Bittner, Edward Frank, chief metallurgist, Norge Division, Borg-Warner Corp., Detroit.

Burnette, Howard E., draftsman, Continental Aviation & Engineering Corp., Detroit.

Edmonson, Glenn V., staff engineer, Hydraulic Coupling Division, American Blower Corp., Detroit.

Fill, Lynn A., chief engineer, Motor Products Corp., Detroit.

Hildebrand, Glen E., draftsman, Continental Aviation & Engineering Corp., Detroit.

Inskeep, Oliver W., charge of engine design, Research Laboratories, General Motors Corp., Detroit.

Martin, Richard F., chief of engineering, Detroit Ordnance District, Detroit.

Peterson, Alfred H., Jr., general engineering, Precision Spring Corp., Detroit.

Rau, John Charles, Jr., draftsman, tank engineering, U. S. Army, War Department, Detroit.

Schaffer, David G., engineer, Continental Motors Corp., Detroit.

Watkins, George Benson, director of research, Libbey-Owens-Ford Glass Co., Toledo, Ohio.

Indiana Section

Bacon, Robert L., dynamometer operator, International Harvester Co., Inc., Fort Wayne, Ind.

Ferguson, Thomas B., lubrication engineer, Standard Oil Co. of Ind., Indianapolis.

Howe, John D. production engineer, Allison Division, General Motors Corp., Indianapolis.

Mitchell, Wayne G., district sales supervisor, Electric Auto-Lite Co., Toledo, Ohio. Mail: 6221 North Rural St., Indianapolis.

Roemer, Arthur James, mechancial draftsman, Allison Division, General Motors Corp., Indianapolis.

Wallace, William P., general research, Perfect Circle Co., Hagerstown, Ind.

Kansas City Section

Hake, Albert F., lubrication engineer, Cities Service Oil Co., Kansas City, Mo.

Metropolitan Section

Bell, Kenneth D., junior test engineer, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Paterson, N. J.

Breinig, Edward C., chief engineer, Dowty Equipment Corp., Long Island City, N. Y.

Cohen, Alexander, associate procurement inspector, U. S. Army, War Department, Air Corps, Materiel Division, New York City.

Comer, Thomas F., test engineer, Simmonds Aerocessories, Inc., Long Island City, N. Y.

Dawson, William H., Jr., junior engineer, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Paterson, N. J.

Dixon, Walter L., Jr., vice president, Twin Disc Clutch Parts & Service Co. of N. Y., Inc., New York City.

Garrigan, Thomas E., assistant to project engineer, Simmonds Aerocessories, Inc., Long Island City, N. Y.

Grouleff, Paul Henry, Lt. U. S. Navy, U. S. S. Marlin, c/o Postmaster, New York City.

Jackson, Paul R., draftsman, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Paterson, N. J.

Jacobson, Harry R., Capt., U. S. Army, Quartermaster Corps, Motor Transport Division, Washington, D. C. Mail: 346 N. 4th Ave., Highland Park, N. J.

James, Robert Louis, test engineer, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Paterson, N. J.

Koenig, William W., methods engineer,

Aircraft Engineering

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Mellenger, Edmund Rex, engineer surveyor, Lloyds Register of Shipping, New York City.

Mock, Louis Francis, Jr., field engineer, Ethyl Gasoline Corp., New York City.

Parilla, Arthur R., chief engineer, Chicago Pneumatic Tool Co., Garfield, N. J.

Schaal, K. R., president, U. S. Tire Supply Co., Inc., New York City.

Scheerer, Arthur M., assistant experimental engineer, Wright Aeronautical Corp., division of Curtiss-Wright Corp., Paterson, N. J.

Senseney, George Towner, vice president, Mobile Refrigeration, Inc., New York City.

Stoecker, Carroll L., junior engineer, American Airlines, Inc., Jackson Heights, N. Y.

Taylor, Myron L., engineer, Eclipse Aviation, division of Bendix Aviation Corp., Bendix, N. J.

Taylor, Richard, service manager, Ramapo Auto Sales Co., Inc., Suffern, N. Y. World Bestos Corp., Paterson, N. J.

Milwaukee Section

Payette, Joseph L., division superintendent, Civilian Conservation Corps, Motor Repair Division, Milwaukee.

New England Section

Wishman, Harry W., Jr., president and treasurer, Preferred Products, Inc., Boston.

Northern California Section

Batchelder, A. H., division supervisor in charge of fuels, specialties, etc., Standard Oil Co. of Calif., Richmond, Calif.

Harrington, George E., chief inspector, Hall-Scott Motor Car Co., Berkeley, Calif.

Hundley, Roy E., assistant chief engineer, Enterprise Engine & Foundry Co., San Francisco.

Macpherson, John H., Jr., research engineer, Standard Oil Co. of Calif., Richmond, Calif.

Northwest Section

Bellamy, Merle C., district manager, Timken Roller Bearing Co., Seattle, Wash.

Egbert, Sherwood Harry, assistant to superintendent, Boeing Aircraft Co., Seattle, Wash.

Ogden, Edgar Bert, shop superintendent, Consolidated Freightways, Spokane, Wash.

Pingrey, Albert Walter, automotive instructor, J. M. Perry Institute, Yakima, Wash.

Saunders, William Alexander, lubrication and gasoline engineer, Inland Empire Refineries Inc., Spokane, Wash.

Seaberg, Carl R., shop superintendent, Inland Petroleum Transportation Co., Inc., Seattle, Wash.

Oregon Section

Bradshaw, Rudy L., division superintendent, Civilian Conservation Corps, Motor Repair Division, Salem, Oregon.

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Philadelphia Section

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Pittsburgh Section

Ulrich, Rudolph, vice president, Bacharach Industrial Instrument Co., Pittsburgh.

St. Louis Section

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Root, Robert E., junior layout draftsman, Emerson Electric Mfg. Co., St. Louis.

Strasser, William H., superintendent of equipment, Midland Bus Co., St. Louis.

Wich, John A., engineer, Busch-Sulzer Bros. Diesel Engine Co., St. Louis.

Southern California Section

Bodner, Charles Herbert, hi-cycle development, Vega Aircraft Corp., Burbank, Calif.

Chaffee, A. W., salesman, Smith Booth Usher Co., Los Angeles.

Cleves, William B., vice president, Yellow Cab Co. of California, Los Angeles.

Dilworth, Joseph Edward, Adel Precision Products Corp., Burbank, Calif.

Douglas, Donald Wills, Jr., power plant test engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif.

Farrar, Charles Warner Jr., checker, Douglas Aircraft Co., Inc., El Segundo, Calif.

LaFrentz, Fred H., district manager, American Liquid Gas Corp., Los Angeles.

Nickerson, Douglas Blain, layout draftsman, Lockheed Aircraft Corp., Burbank, Calif.

Moore, Carl E., Ramsey Accessories Mfg. Corp., St. Louis, Mo. Mail: 565 Prescott St., Pasadena, Calif.

Southern New England Section

Auto-Ordnance Corp., Bridgeport, Conn.

Roisman, Milton, carburetor mechanic, Pratt & Whitney Aircraft, division of United Aircraft Corp., East Hartford, Conn.

Southwest Group

Edwards, Roy E., research engineer, Halliburton Oil Well Cementing Co., Duncan, Okla.

Lockwood, Fred H., director of public relations, Guiberson Diesel Engine Co., Dallas, Texas.

Washington Section

Ansell, Bertram, junior chemical engineer, fuels and lubricants, National Bureau of Standards, Washington, D. C.

Bell, Albert D., junior physicist, National Bureau of Standards, Washington, D. C.

Laskin, Eugene B., assistant engineer, National Advisory Committee for Aeronautics, Langley Field, Va.

Outside of Section Territory

Johnson, Lloyd Edward, research supervisor, Caterpillar Tractor Co., Peoria, Ill.

Marshall, Daniel Arthur, Jr., layout draftsman, Lycoming Division, The Aviation Corp., Williamsport, Pa.

Mawdsley, David William, garage foreman, Consolidated Mining & Smelting Co., Trail, B. C., Canada.

Norton, Fred, chief engineer, lubrication department, The Ohio Oil Co., Findlay, Ohio.

Paul, Carl Hutton, research engineer, Caterpillar Tractor Co., Peoria, Ill.

Pence, F. A., Northwestern representative, Sun Oil Co., Minneapolis, Minn.

Pochlmann, Alfred E., head instructor, officers, U. S. Army, Fort Crook Quartermaster Motor Transport School, Fort Crook, Nebr.

Stone, Charles S., research engineer, Caterpillar Tractor Co., Peoria, Ill.

Tanner, Theodore J., chief maintenance engineer, Eastern Air Lines, Inc., Miami, Fla.

Foreign

Parsons, S. F. H., chief design engineer, C. A. V., Ltd., Acton, London, W 3, England.

Yager, Leland R., engineer, Pan American-Grace Airways, Inc., Lima, Peru.

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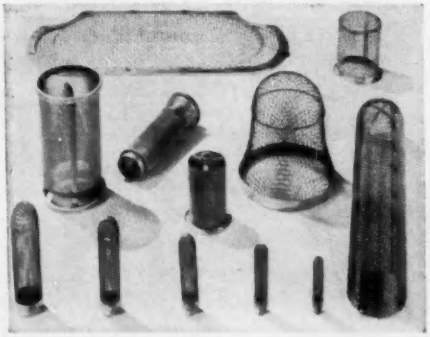

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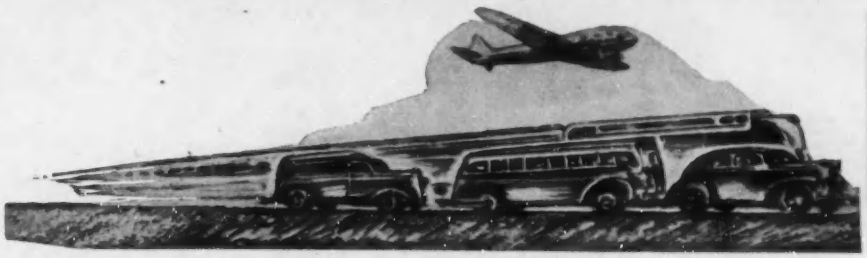


News of the **AUGUST** *Issue*

By Norman G. Shidle

Winning the War . . . Plus

TOO many people, in our not-too-humble opinion, tacitly accept the concept that going to work for the government in this emergency must *per se* constitute a greater contribution to winning the war than staying home and firing new ammunition from the same old dug-out.

Frequently an automotive engineer or executive can and does make a far greater contribution by going to Washington. Sometimes the opposite is the case. It all depends.

Sound government planning – the basis of successful all-out-war effort – requires, in certain departments, the experience that only such men can furnish. But active participation in a productive war job at home may, on occasion, outrank activity in fast-spawning governmental bureaus. A private operation perfectly keyed to war needs requires a minimum of governmental

(*Concluded on page* 18)

'See' How Vapor Lock Obstructs High-Altitude Fuel Feed Systems

Aircraft Surface Strain Charted by New Technique

WHEN a man lifts too heavy a weight or over-exercises, he feels the strain. A sensitive nervous system transmits pain, warning the individual against a repeat performance.

While no such intricate system has been set up in airplanes to warn of excessive surface stresses, a big step in that direction was taken by the Douglas Aircraft Co., when it adopted the strain-gage technique, according to C. R. Strang, Douglas engineer. As he says in the August SAE Journal, this technique "provides a seventh sense that permits the designer to see and understand the inner workings of a structure under load." (See caption in col 3.)

It is proving invaluable to airplane designers in giving them more exact knowledge of the stress distribution in airplane structures.

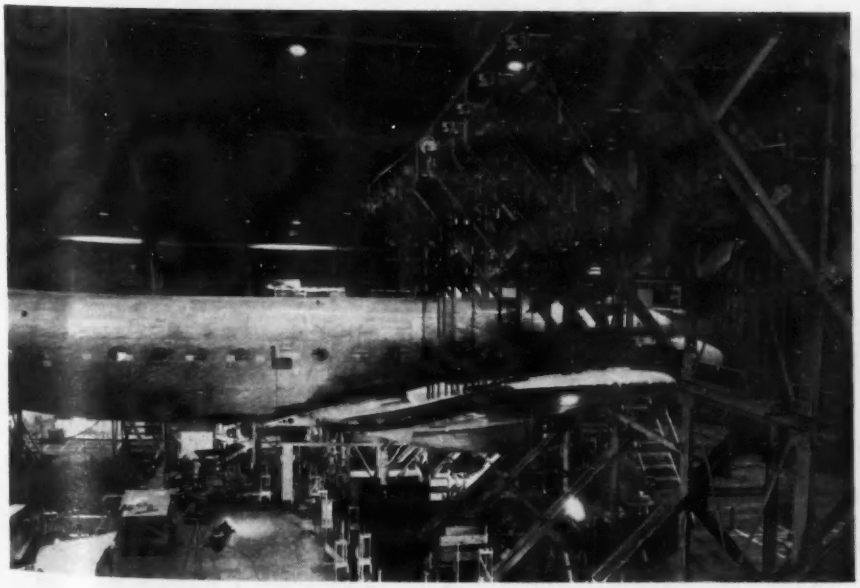
IT is now possible to "see" how vapor lock, that dreaded cause of engine failure, develops in aircraft fuel systems on flights up to 40,000 ft!

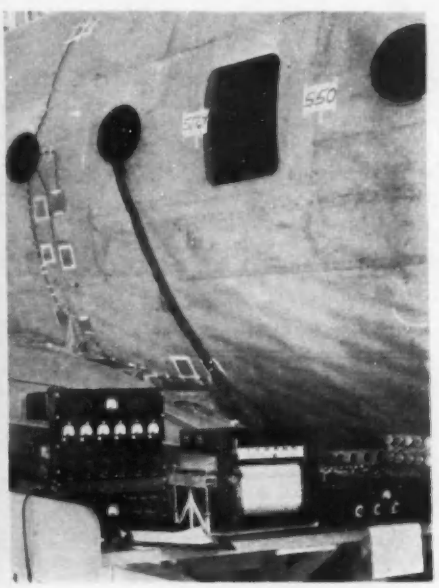
Through ingenious glass test equipment developed by the versatile father-and-son engineering team, W. H. and R. R. Curtis, of Thompson

(*Concluded on page* 18)

GIANT DC-4 IS STATIC TESTED BY THE "STRAIN-GAGE" TECHNIQUE. *(See pics below.) Note the wires cemented to the the fuselage around the front porthole, the intricate amplifying and recording equipment on stand in front of wing. Center box with the glass window is the all-important potentiometer which charts "strain" on paper for permanent record. (See story in col. 2.)*

In general, the equipment consists of resistance units of fine wire cemented to the stressed surface under investigation and connected to a suitable bridge circuit, Mr. Strang says. The cross-section, and hence the resistance of the gage unit, is varied by the elongations and contractions to which it is subjected. The resulting unbalance of the bridge circuit is amplified by electronic means and charted on paper.





Vapor Lock Obstructs Fuel Lines

(*Concluded from page 17*)

Products, Inc., engineers can now observe, without leaving the ground, the formation of insidious air bubbles in the fuel lines on which the engine must depend for its life. These bubbles are tell-tale indicators of vapor formation in the lines, the cause of vapor lock.

In the cold blue sea of sky – higher and higher above the loftiest cloud banks – many of the air battles of World War II are being fought. At these great altitudes, weather ceases to be a controlling factor in bombing forays, and planes are able to fly faster.

Little wonder warring nations are straining all resources to perfect aircraft fuel systems to withstand the rapid pressure drops encountered in such high-altitude operation. The whole trend of the new aerial warfare may hinge on high-altitude aircraft engineering.

The Curtis' fuel system (full details in the August SAE Journal) is expected to have a direct effect on America's ability to develop vapor-free aircraft fuel systems under all combat conditions, and win the initial advantage in the Battle for the Substratosphere.

Engineers will remember W. H. and R. R. Curtis for their brilliant article "New High-Altitude Fuel System for Aircraft" in the July, 1941, SAE Journal.

Some Fresh Views On Valve-Gear Design

CARL VOORHIES of Wilcox-Rich, believes that, in designing a poppet-valve engine, the entire valve gear should be considered as a whole – from camshaft right on up to the valve seat insert. "The design of one part should be related to all the other parts," he says.

Mr. Voorhies' August SAE Journal views are directed to the special interest of diesel engineers.

There is an increasing demand for speed in diesel engines, in order to develop more and more power from a given size engine, he says. This necessitates operating valve gears at higher speeds, which, in turn, means increased rates of valve opening and closing.

In a particularly detailed article, Mr. Voorhies tackles each valve-gear part and design-analyzes it "in relation to all the other parts."

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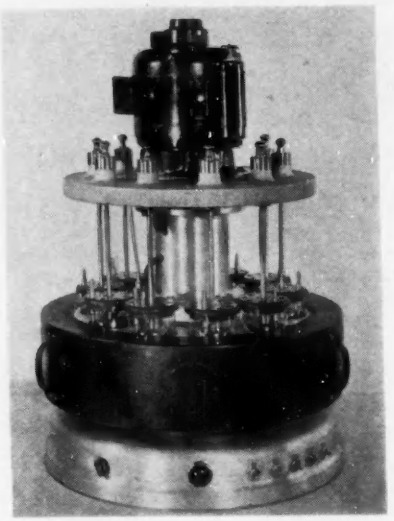

THAT AMERICAN PILOTS MAY ALWAYS RIDE BEHIND THE WORLD'S FINEST ENGINES, *the MacCoull corrosion tester is designed to guard the quality of our warplane powerplants.*

Modus operandi: the bearing to be corrosion-tested is submerged in a beaker of test oil maintained at high temperature. A spinner is lowered in, the cover secured, and the whole bearing assembly is spun at 3000 rpm. At designated periods, the bearing is removed and weighed to determine the amount of metal that is eaten away through corrosive action.

Since 10 of these units can be tested at once in one corrosion tester, the poorer metals or oils can be "weeded out" quickly, and engine tests need be made only on those which indicate promise from a corrosion standpoint.

Read the complete technical story in the August SAE Journal.

Novel Corrosion-Testing Idea

THERE is no rationing of Yankee ingenuity. As the engineering miracles of World War II roll in, one feels an imaginative "it-can-be-done" attitude permeating the whole fabric of our American war effort.

Take the matter of testing the tendency of certain aircraft and automotive engine oils to corrode bearing metals, and of testing corrodibility of the bearings themselves.

The high temperatures and high speeds of today's engines demand intimate knowledge of the corrosion behavior of these oils and bearings under a variety of conditions, if oils of minimum corrosiveness and bearings of maximum corrosion resistance are to be developed.

How to obtain such data quickly, however, is another matter.

A novel test method for developing these data, evolved through the cooperative efforts of three engineers of The Texas Co. and Pratt & Whitney Aircraft, is described in the August SAE Journal. (See picture at left.)

Another striking example of Yankee ingenuity at work!

Here's a time-saver that is immeasurably stepping-up the quality of American war plane engines. Engine men will find exciting technical fare in "An Oil Corrosion Tester," in the August SAE Journal.

Winning the War . . . . Plus

(*Concluded from page 17*)

control personnel to do a good job.

As Manpower Czar McNutt progresses with sorting and placing personnel resources, it is reasonable to suppose that the relative war-importance of governmental bureaus and producing private industries will be measured by a single yardstick. There might even be an increasing attempt to utilize the vital force of private groups to sell – and perhaps administer – a greater proportion of future governmental control programs.

Sometimes, for instance, a group of engineers may make their greatest contribution, not only in staying on the job where they are, but also in helping governmental officials to achieve needed controls by using the full influence and strength of just such men as themselves. SAE groups working with and for government agencies already furnish scores of examples of the effectiveness of such procedures. Pre-selling of government programs to specialists or groups normally looked upon as authorities in a given area and then using those groups to sell the public frequently could get results much quicker than continued expansion of government bureaus.

The government's jobs must and will be done. As automotive engineers and executives point ways to get them done through private, technical, and merchandising groups – without increasing governmental personnel – they will be making a plus contribution to winning the war – and the peace.